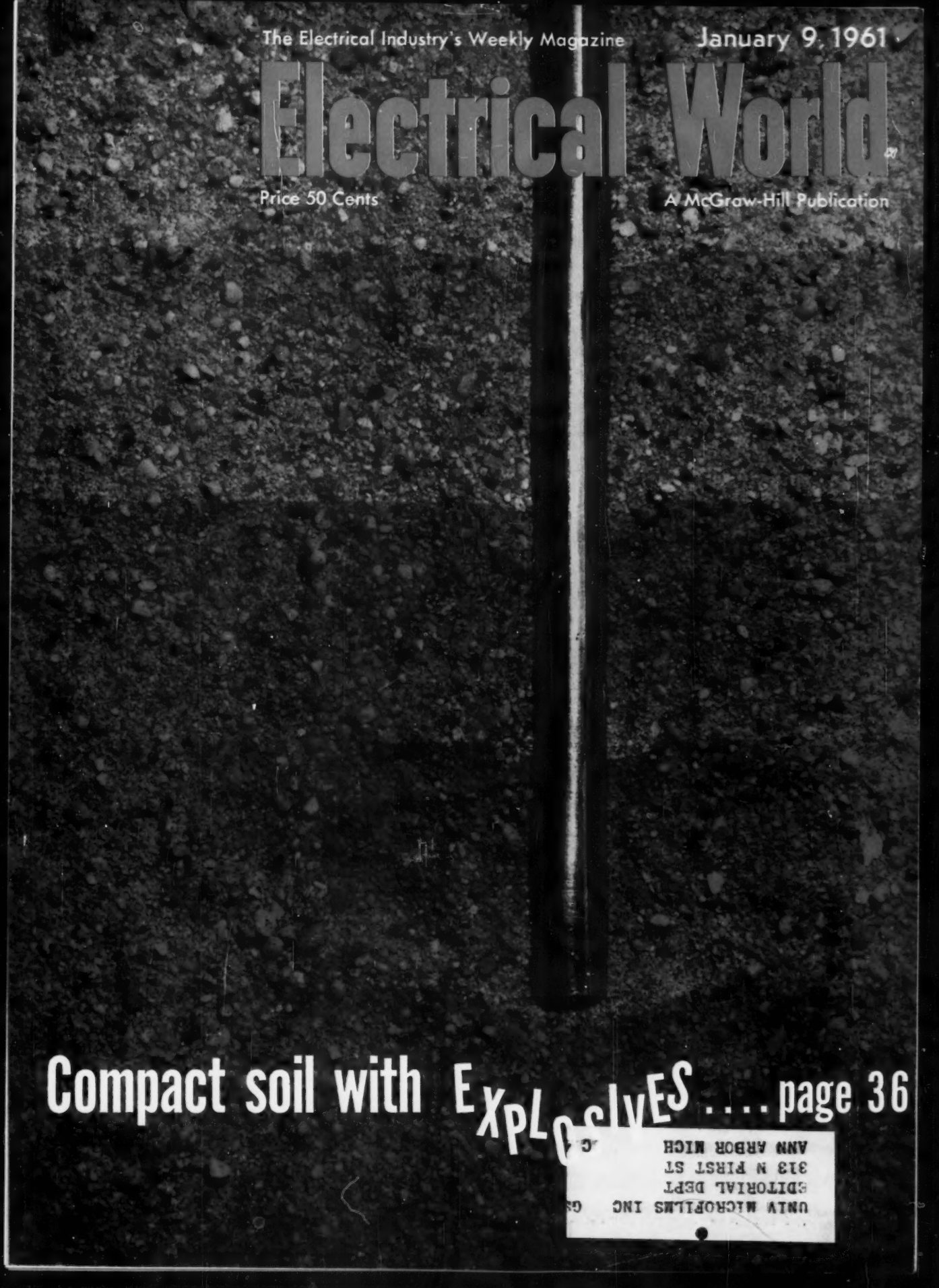
The Electrical Industry's Weekly Magazine

January 9, 1961

Electrical World

Price 50 Cents

A McGraw-Hill Publication



Compact soil with EXPLOSIVES .... page 36

UNIV MICROFILMS INC
EDITORIAL DEPT
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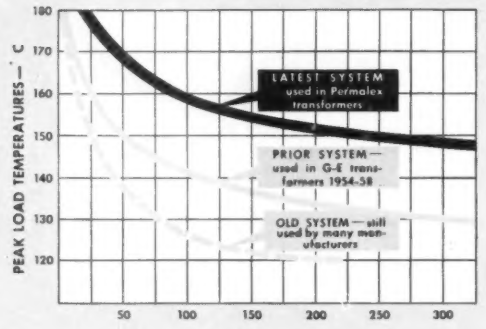
ANN ARBOR MICH

How General Electric Helps Keep Distribution Transformer

PRICES DOWN, VALUES UP *through . . .*



LATEST PRODUCT of General Electric research—Permalex transformers—have longer life and increased loadability, at no extra price.

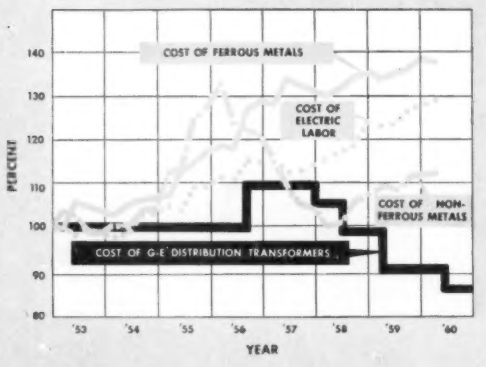


CHART DRAMATIZES General Electric's success in holding down prices. While labor and material costs have steadily risen, G-E distribution transformer prices are actually lower than in 1953.

INNOVATIONS

. . . developed in response to utility needs for improved performance and reduced costs. Part of the money you pay for each G-E distribution transformer goes into the research and engineering through which General Electric continuously improves the transformers you buy. Innovations such as Permalex* transformers with Melalast finish, for example, result in reduced operating costs for you.

LOAD BUILDING

. . . through mutual efforts. General Electric has long been a leading supporter of electric utilities' efforts to bring America the benefits of electric power. These efforts accelerate load growth, creating a need for more and larger distribution transformers. This increasing demand contributes to lower prices through . . .

MECHANIZATION

. . . in existing and new facilities. General Electric's program of increased manufacturing efficiency through mechanization has resulted in price reductions in 1957, 1958, 1959 and again this year. Mechanization has depended upon your acceptance of . . .

STANDARDIZATION

. . . resulting in fewer ratings. A survey conducted by General Electric revealed that five pole-type ratings—10/11.2, 25/28, 50/56, 100/112, and 167/187 kva—are preferred among utilities across the country. General Electric demonstrated its confidence in utility support of standardization by lowering preferred-kva transformer prices. Cost studies show that this standardization will continue . . .

. . . TO KEEP UTILITIES' TOTAL DISTRIBUTION TRANSFORMER OWNING COST AT THE LOWEST POSSIBLE LEVEL

Significant as this program is, it is only one of the many continuing efforts in distribution, transmission, and generation through which General Electric is helping electric utilities to serve the nation's growing demand for low-cost electric power.

*Trademark of General Electric Co. 604-13

GENERAL ELECTRIC

Published for 87 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Electrical World

JANUARY 9, 1961

Vol. 155, No. 2

Electrical What in the World . . .

Almost any "A" student will tell you that, while it is hard to get to the top of the class, it is even more of a challenge to his ingenuity and energies to stay there. In a way this parallels our feeling about *Electrical World*, if you'll forgive a bit of plain but honest boasting: Staying at the top is our problem, too. But there is good reason for this effort . . .

About 65% of our subscribers are in electric utilities—investor-owned, municipally-owned, cooperatives, or federal or state agencies. This will surprise no one. These readers, however, bear responsibility for 98.9% of the generating capacity in the nation. Breaking this down a little further, they represent 99.9% of investor-owned utility generating capacity, 86.6% of municipally-owned capacity, 97.3% of rural cooperatives' capacity, and 98.8% of that of all federal and state agencies. This is what puts us "at the top of the class," and also keeps us working late to stay there.

The implied challenge in the numbers alone is clear. But their real significance, to us, lies simply in this: All of the electrical industry, regardless of ownership, and including the equipment manufacturers, recognizes the pressing need to know not only about its own segment but about the *whole* industry. We at *Electrical World* feel that the challenge to us is to present, fairly and accurately, the information that shows the relationship of one to another, and of each to *all* of the others. Should we fail to do this, we trade in our valued "A"-student standing for a dunce cap.

Chuck Hochgesang

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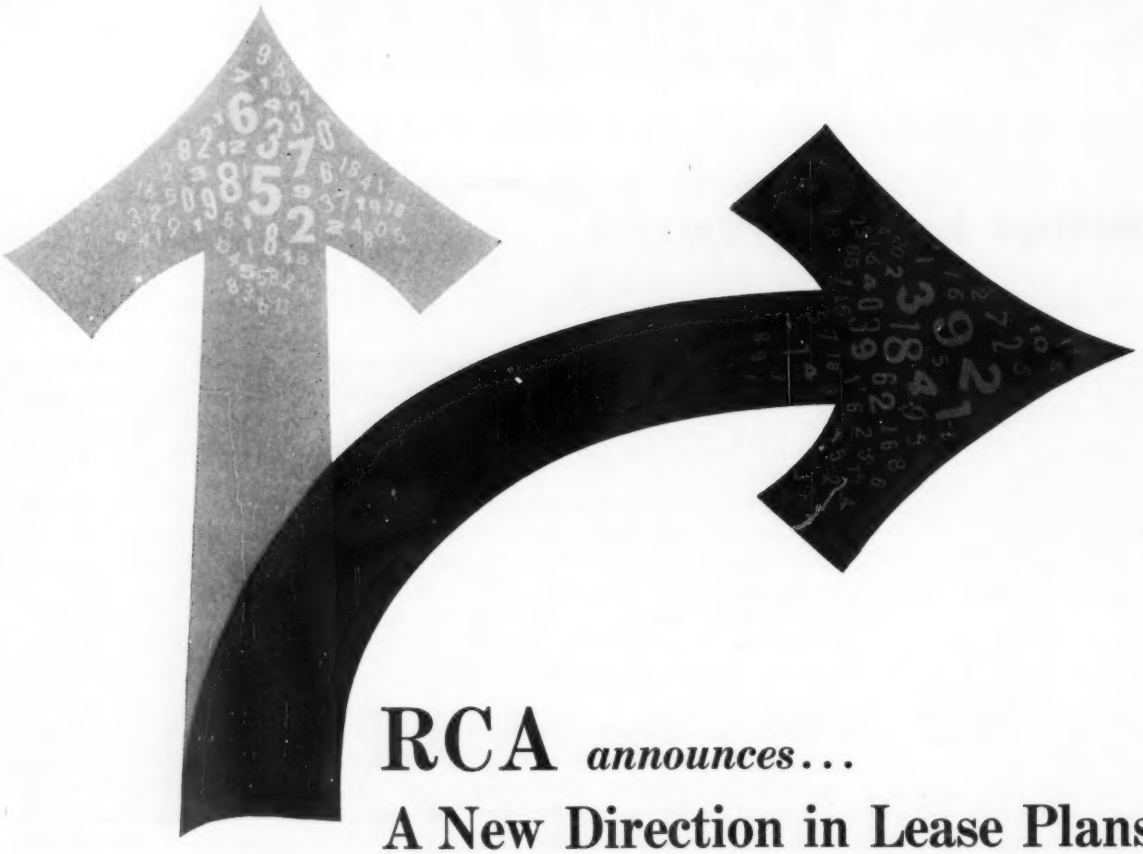

RCA *announces...*

A New Direction in Lease Plans for Electronic Data Processing Equipment

RCA now offers a choice of *four* new lease plans that permit you to rent RCA Electronic Data Processing Equipment, and all the guidance and service that goes with it, *on a basis geared to your own particular usage requirements.* This major departure from customary leasing practice is another RCA innovation . . . an indication of RCA's responsiveness to the customer's needs.

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Because of the high degree of reliability built into each RCA EDP System, all of the above lease agreements include primary shift maintenance of the equipment. Since RCA's Electronic Data Processing Systems have this unique built-in reliability, maintenance and service are kept to a minimum, you receive the advantage of a more attractive rate. Maintenance service beyond the primary shift is available at a flat rate per man-hour, as needed.

Take advantage of RCA's new contract arrangements to keep your paperwork at a minimum, your EDP quality at a maximum! For full details and rates, write Electronic Data Processing Division, Radio Corporation of America, Camden 2, N.J.

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Letters

Report on Management Course Praised

To the Editor:

I would like to express my thanks to you . . . for the excellent reporting job you did on the management program which we conducted under Electric Council of New England auspices. (This was carried in the Nov. 28 issue of *Electrical World,* page 82.)

As you know, I have lived with this program from the incubation of the idea all the way through to the tabulation of the survey results and the paying of the bills. Speaking from this perspective, I feel that your article caught the essence of what we were trying to do and why, the means we used to accomplish our objectives and an evaluation of its effectiveness. Considering the vast amount of background material, you fellows have distilled the essential facts into a highly readable article which reflects the spirit of the program as well as the facts of the operation.

J. R. Maher
Employment & Training Manager
Connecticut Light & Power Co

To the Editor:

As a result of your Nov. 28 report on our Middle Management Course, we have received a number of inquiries from utilities interested in the program.

Your readers may be interested to know the sponsoring committee. They are: J. R. Maher, Connecticut Light & Power Co, Chairman; J. J. Foley, New England Electric System; Eliot Priest, Public Service Co of New Hampshire, W. P. Rayner, Blackstone Valley Gas & Electric Co; and E. P. Smith, United Illuminating Co.

In addition, Messrs R. H. Pearson, Hartford Electric Co and R. J. Lyman, New England Electric System, assisted as conference leaders.

Charles R. Bragg
Executive Director
Electric Council of New England
470 Atlantic Ave
Boston 10, Mass.

This is your column in Electrical World. Correspondence should be addressed to Letters Editor, Electrical World, 330 *W* 42*nd St, New York* 36, *N. Y.*

Dateline . . .

Electric Utilities, USA—Electric utility executives across the nation were asked last week what they think about the results of the recent antitrust action against electrical manufacturers.

Specifically, they were asked:

- Have you been contacted by manufacturers regarding possible out-of-court settlement of damages?
- Do you favor out-of-court settlement?

In all, 50 utilities were contacted by McGraw-Hill reporters, and as might be expected, most were hesitant to comment on a situation that is both new and complicated.

Only eight of the 50 said they had been approached by the manufacturers since the end of the antitrust action.

Evidence that the utilities are attempting to analyze the effects of the action is indicated by the 19 who said they are studying the situation.

Out-of-court settlement was favored by 14 of the companies, but this was usually qualified by spokesmen. In most cases they added something to the effect that this would depend on offers made by the manufacturers.

Several declined to comment on what action they might take until (1) they were approached by the manufacturers, or (2) they had completed their studies to determine what damages, if any, they are entitled to.

In the two cases of doubts that out-of-court settlements would be possible, one is a municipal utility district and the other is a cooperative.

One utility president commented that in a recent utility meeting in Chicago ". . . it was the general opinion, and my opinion, we would do much better outside of court because of the extra expense of litigation.

"The general feeling was that we did not want to do anything to cripple the manufacturing firms and

(*Continued on page* 29)

ELECTRICAL WORLD
Vol. 155, No. 2 January 9, 1961

Published weekly by McGraw-Hill Publishing Co., Inc., James H.McGraw (1860-1948), Founder. **Executive, Editorial, Circulation and Advertising Offices:** McGraw-Hill Building, 330 West 42nd Street, New York 36, N. Y. Printed at 99-129 North Broadway, Albany 1, N. Y. See panel below for information regarding subscriptions or change of address.

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United States and Canada subscription rate for individuals in the field of the publication $6.00 per year; single copies 50 cents. Other Western Hemisphere and the Philippines $20.00 payable in advance and other countries $30.00 payable in advance.

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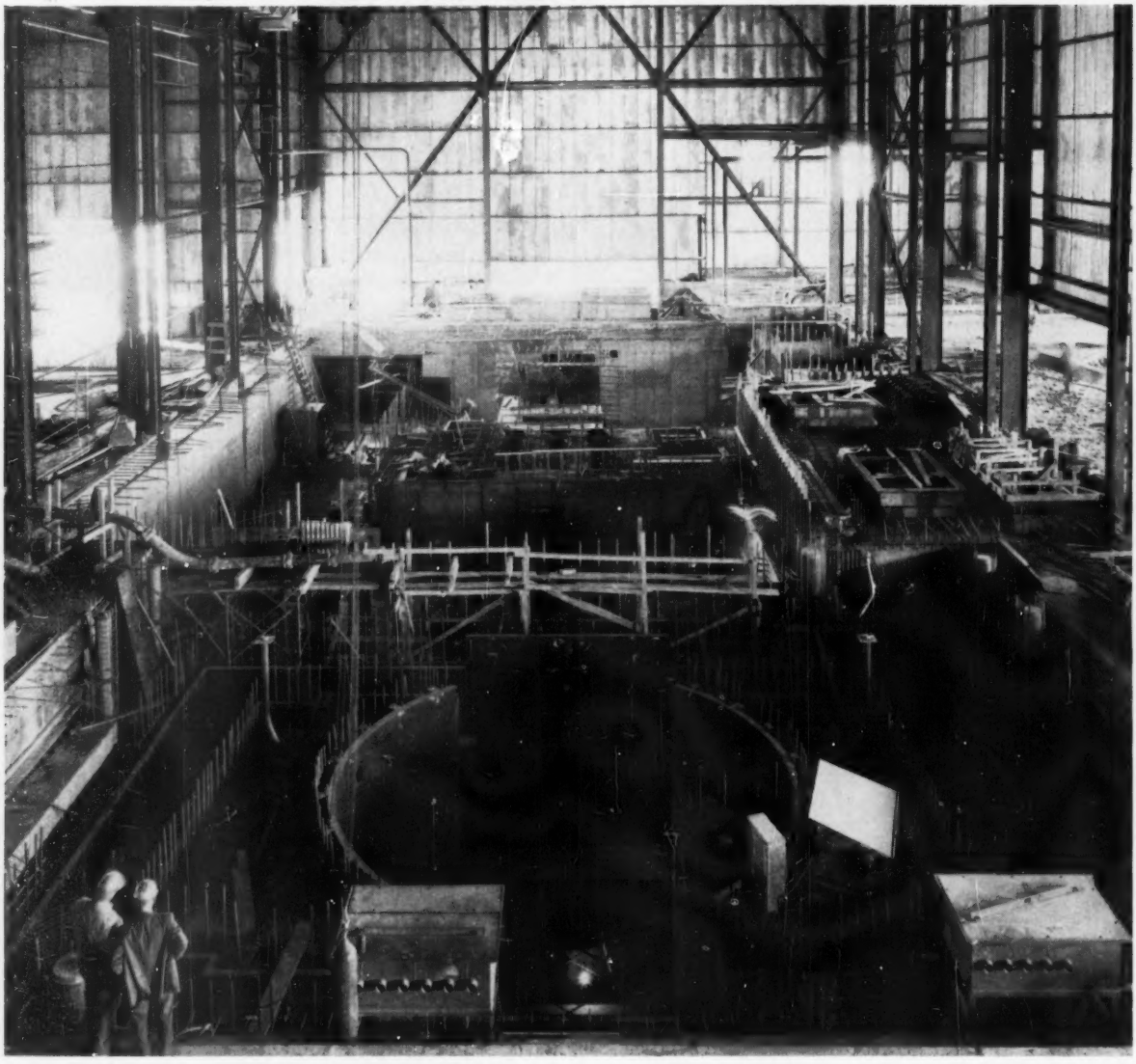
75,000 KW Sodium Graphite Reactor station for Consumers Public Power District at Hallam, Nebraska



The Peaceful Atom

Helping the world double its power supply in the next ten years

The fuel of the future is in the atom. But even now, lights are burning, wheels are turning, thanks to atomic fuel. Atomics International, a world-wide leader in advanced, high-performance reactor systems, has over 15 years' experience in designing, constructing, and operating reactors. Two of the world's most advanced atomic power stations are now being built by AI under AEC programs. The wealth of experience and facilities at Atomics International will help the world's power-producing companies in their plans to double the supply of electricity in the next ten years.

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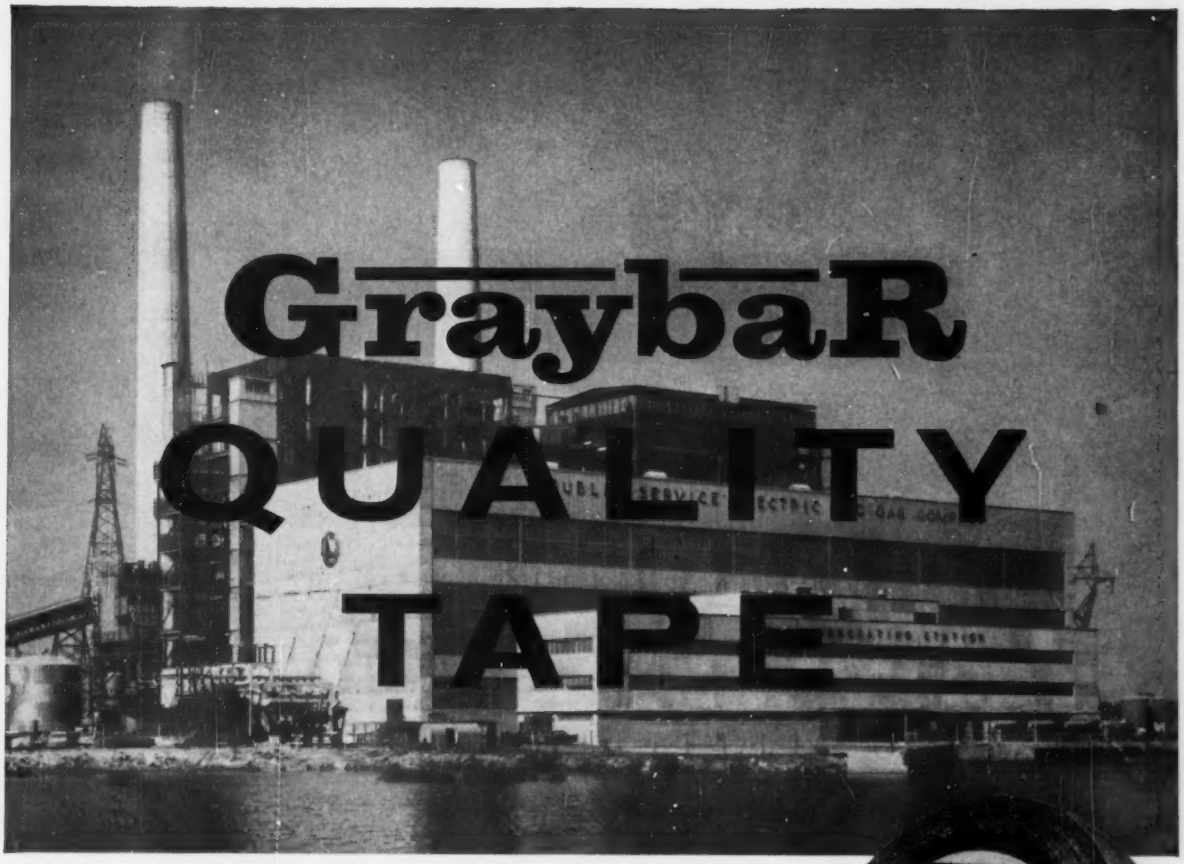

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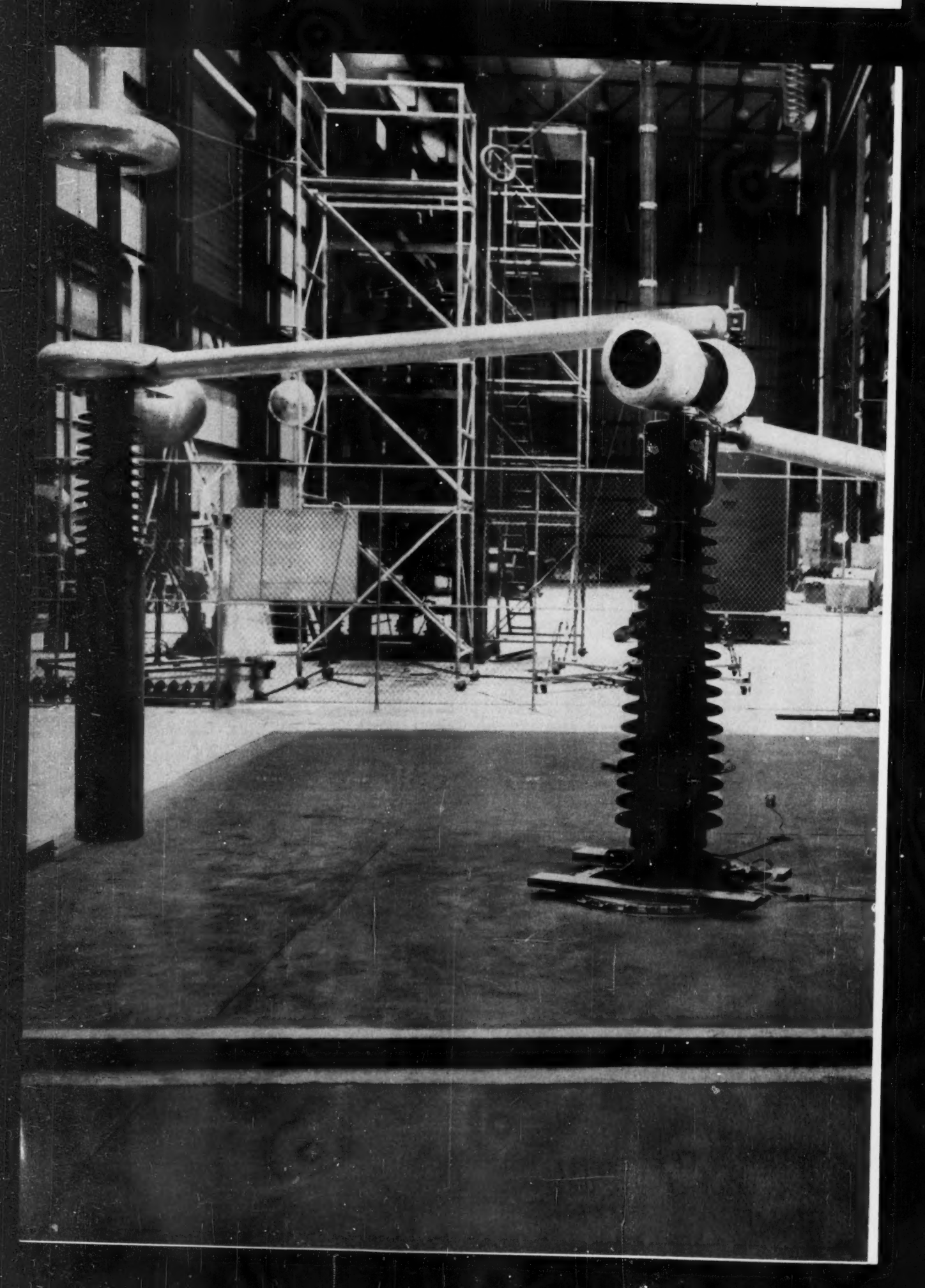

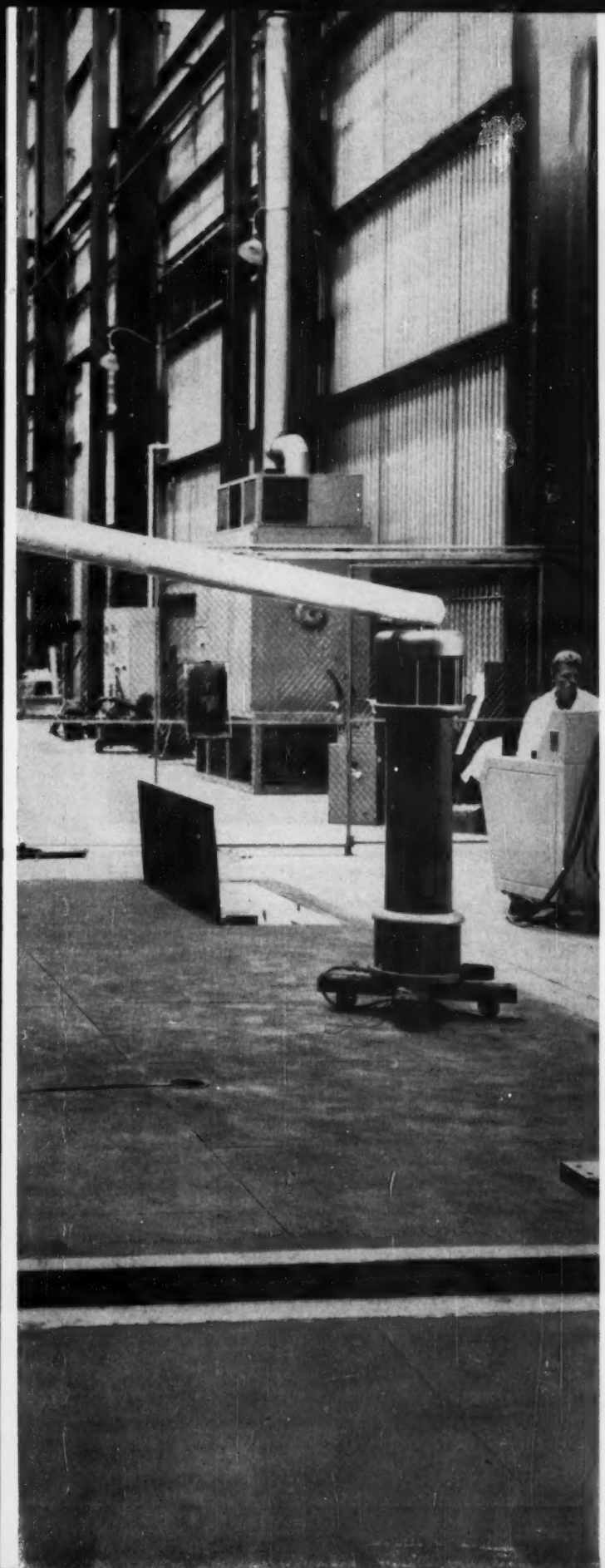

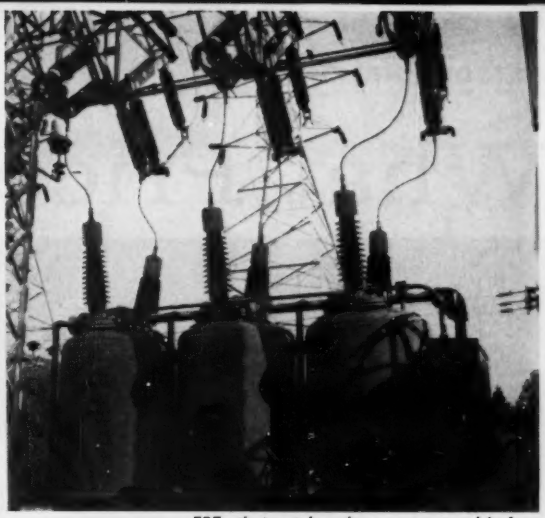

FPE oil circuit breakers assure trouble-free service at Niagara-Mohawk installations.

from an 85 ft. high test tube...come breakers and bushings with longer lives!

The high-voltage laboratory of Federal Pacific, towering almost ten stories above California's Santa Clara Valley, is dedicated to making the most advanced equipment *even better.* Here we design a full range of power circuit breakers and high-voltage entrance bushings . . . produce them in a large modern facility . . . run complete tests with as much as 2,000,000 volts applied. Federal Pacific's high-voltage laboratory, the largest and most completely equipped in the West, helps produce major improvements in performance. Proof: in 40 months of rugged service at Niagara-Mohawk's Lighthouse Hill installation in upstate New York, and after 45 automatic operations under fault conditions and 23 operations under load conditions, absolutely no contact maintenance has been required on Federal Pacific's Type RHE breakers. With 50 years of leadership in circuit breaker design and construction, you can expect performance like this from Federal Pacific—superior performance from exclusive features like the rotating contact structure, the only moving part in the tank, which provides six equal breaks in series per pole. For more information on laboratory-proven, reliable, low-maintenance FPE breakers, write for Bulletin 7223, Dept. FP-8, Federal Pacific Electric Company, Newark 1, N. J.

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SILICONE NEWS from Dow Corning

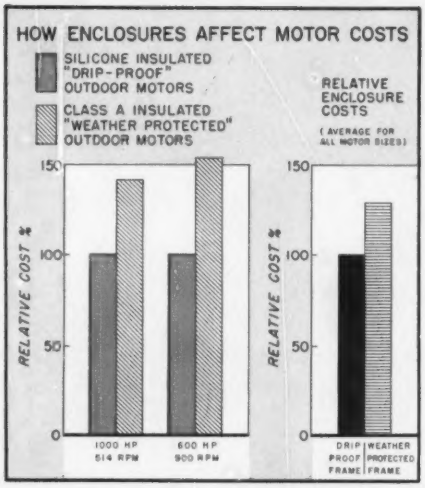
What Price Difference?

There's No Price Premium . . . Just Savings . . .When You Specify Silicone Insulation

For Outdoor Locations: You can save 30% and more on initial cost of form-wound motors by specifying silicone insulation systems made with Silastic, the Dow Corning silicone rubber. Here's why: 1) Silicone insulated motors are now available at no price premium; 2) The insulation system itself is self-protecting, shrugs off weather, humidity, corrosion, dust, even flooding. There's no need for elaborate enclosures that push motor prices up and up. The chart (right) shows how much you save by specifying silicone insulated open motors.

For Indoor Locations: Where ambient temperatures are high, where corrosive fumes or industrial contaminants are present; where relative humidity is pushing 100%; where motors are hosed down — in all these applications and others, too, expensive motor enclosures, and often expensive ducting as well, can be eliminated by specifying silicone insulation.

For Any Location: Silicone insulation systems increase motor service factor by as much as 15 to 30% because of their greater thermal stability. This increased service factor means there's no need to overmotor for occasional overloads . . . and suffer the power factor penalty of part loaded induction motors.



This chart shows one of the ways you save by specifying motors insulated with Silastic.

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Electrical World

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NEXT WEEK

DON'T MISS Electrical World's 32-page special report on the Breed Plant.

The Electrical Week

LATE NEWS ▶ **Power pool for coordinated generation planning** is announced by Wisconsin Power & Light Co and Wisconsin Public Service Corp. The two investor-owned companies, serving 369,000 customers in adjoining territories, see possible 20% reduction in cost per kw from new plan. Existing interconnections between the two utilities include one 138-kv line and two smaller ties.

Cause of an explosion in an AEC-Army experimental nuclear reactor at the National Reactor Test station in Idaho that killed three soldiers had not been determined at midweek. The accident occurred to the experimental, 200-kw SL-1 boiling water reactor operated for the Army. A complete investigation is now being conducted under the direction of Curtis Nelson, chief of AEC's inspection division.

A "low-cost nuclear fusion process" is under study by International Telephone & Telegraph Corp. IT&T, while not confirming reports of a recent significant development, says that "current experiments indeed show encouraging promise." The project has been underway for a number of years.

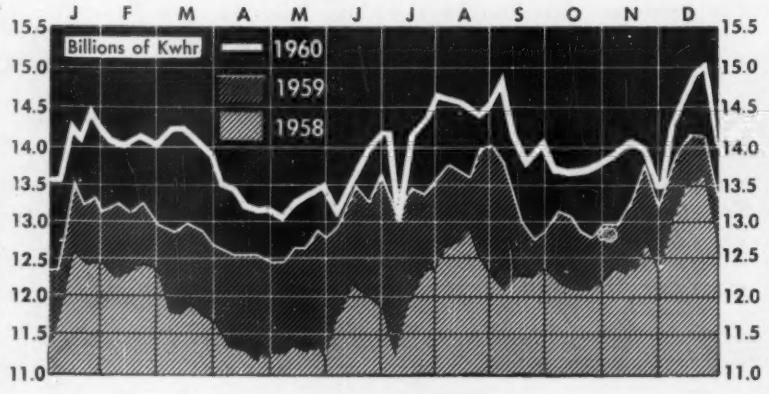
Tampa Electric Co is ordered to cut rates for large industrials 5.4% and boost residential rates 1%, after study by Florida Railroad and Public Utilities Commission. Average residential monthly bill would rise about 37¢.

Ten large Ohio cities will ask state legislature to replace existing rate base law—reconstruction cost new less depreciation—with net investment method used in FPC 1938 ruling. Proposal is more stringent than bill proposed by Governor DiSalle and defeated in 1958.

Washington Public Power Supply System, Nez Perce Dam applicants, last week filed a motion with FPC Examiner William C. Levy to force Pacific Northwest Power Co to submit detailed engineering design data on fishways for the proposed High Mountain Sheep Project. WPPSS already submitted its fishway designs, and is calling for PNP to do likewise "as a matter of equity."

Rural Electrification Administration approves $5.45 million loan to Dairyland Power Cooperative, La Crosse, Wis. The generating and transmission co-op, which serves 27 distribution co-ops, will build 84 miles of 161 kv, 282 miles of 69 kv, and four miles of 34.5 kv. Dairyland has 266-Mw generating capacity and has borrowed over $84 million from REA to date.

WEEKLY POWER OUTPUT—Up 2.9% (Week ending Dec. 31), Kwhr 13,956,000,000



Per Cent Change From Previous Year

	Dec. 17	Dec. 24	Dec. 31
Total U. S.	+ 6.2	+13.2	+ 2.9
New Eng.	+ 7.2	+14.1	+ 6.2
Mid. Atlan	+ 3.1	+10.3	+ 5.3
Cent. Indust.	+ 0.8	+ 8.4	− 2.8
West Cent.	+ 8.3	+17.0	+ 4.2
Southeast	+11.2	+19.7	+ 5.1
South Cent.	+ 7.8	+13.8	+ 3.8
Rocky Mount.	+20.2	+23.1	+12.9
Pacific			
NW	+ 9.6	+12.0	+ 2.9
SW	+ 4.2	+10.6	+ 3.1

Seasonally Adjusted Index 277.5
Week Ago 276.7 Year Ago 265.9

Source: Edison Electric Institute

Supply Lines

MANUFACTURERS SET NEW RECORD, BUT CAUTIOUS ABOUT '61

Electrical manufacturers take a cautious outlook for 1961 business after racking up a new high in shipments in 1960. For the year ahead, manufacturers in all categories of electrical equipment and appliances foresee shipments totalling $22.8 billion—up slightly from the 1960 record of $22.6 billion. The previous peak in shipments was $21.9 billion reached in 1956.

In releasing the year-end figures and forecast, the National Electrical Manufacturers Assn hedged its outlook by saying the 1961 figures could rise to a new high of $22.8 billion, or could remain at the 1960 levels, or might even drift downward by as much as 5%. "Much depends on an anticipated gain in the economy during the latter half of 1961, as most electrical manufacturers forecast a slow first half," commented Joseph F. Miller, managing director of NEMA.

Even for generation, transmission, and distribution equipment, for which utilities are a primary market, the 1960 shipments were up 3% from the previous year. Total shipments of this type of equipment amounted to nearly $2.2 billion in 1960. But manufacturers of equipment in this category took a much dimmer view of the year ahead, forecasting that shipments would be down by 3.5% to just over $2.1 billion.

Wire and cable manufacturers reported a 5% drop in shipments for 1960 as compared with 1959, and thought that 1961 shipments would be about on level with those of 1960.

Makers of electrical building equipment and industrial equipment also saw a drop off in business in 1961—each forecasting about a 2% drop from last year. The lighting equipment industry forecasts no gains from its $1.5 billion shipments in 1960.

But not all segments of the electrical manufacturing industry were pessimistic. Appliance manufacturers foresaw a 2.5% gain over the 1960 sales of $5.7 billion—and this forecast in the wake of a 5% drop in business from 1959. Makers of insulating materials forecast a 5% gain in shipments for 1961 over 1960, although the '60 figures were about the same as the previous year.

ALUMINUM PRODUCERS EYE ELECTRICAL MARKETS

Aluminum producers are eyeing the electric utility market as they seek to boost consumption during the coming year. In a year-end statement, Lawrence Litchfield Jr, president of Aluminum Co of America, said that the electrical industry's consumption of aluminum in transmission towers alone has tripled since 1958. And he noted that aluminum continues to grow in such major tonnage applications as outdoor substations. Richard S. Reynolds Jr, president of Reynolds Metals Co, said there would be "no let-up in the aluminum industry's pursuit of new markets and expansion of present ones" during 1961.

But producers continue to complain of low prices (firm at 26¢ per lb during much of year). Commented Litchfield, "We hope the pricing low point was touched this year and that firmer prices at higher levels can be established during 1961." Alcoa's president said the aluminum industry problem of excess capacity, a key factor in the pressure on prices, was being attacked vigorously through selective product development and marketing programs. Reynolds expects some decline in

Puget Power

exports of aluminum from record 1960 levels, but he expressed the hope that domestic consumption during '61 will offset any export decline.

PRICE, DELIVERY CHANGES ANNOUNCED BY MANUFACTURERS

Price reductions of up to $34 per unit on self-regulating distribution transformers have been announced by Line Material Industries effective Jan. 1. A. R. Waehner, director of transformer product sales, said the SRT's are being mass produced and this has made it possible to price them as standards instead of as specials. SRT prices are now the same as comparable standard tapped transformers plus a fixed adder dependent on kva size. This fixed adder is directly related to the cost of the control, tap changing mechanism, and the additional primary windings.

Change in delivery policy on hot line tools and grounding equipment has been announced by the A. B. Chance Co effective Jan. 15. Prices will then be on a delivered basis, including freight to destination. In order to cover the freight costs, prices have been adjusted upward approximately 5% the company said.

Revised price structure, which results in average reductions of 15%, on several items of low-voltage switchgear equipment has been announced by General Electric Co. The revisions cover type AK low-voltage power circuit breakers, LB-1 fuseable power protectors, and assembled drawout equipment. The new price structure results from an intensive study of the relative value of various circuit components. Published prices under the new structure will reflect current market levels, GE said.

WHAT IS HAPPENING ON CAPACITOR PRICES?

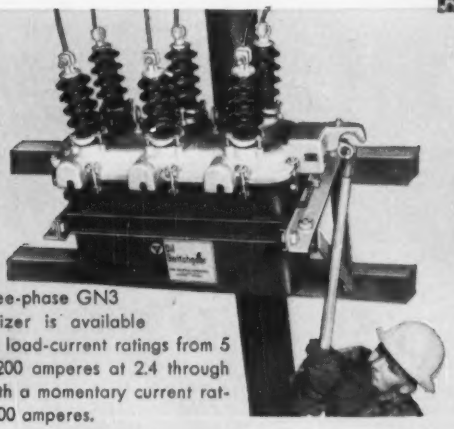
The gyrations of power capacitor prices in December was, in effect, a see-saw hassle between suppliers and utility purchasing men. With several large orders going at less than the $100 mark for 50-kvar units, it looked as if the purchasing men pretty much had their way. The ruckus started off with the Dec. 12 announcement by General Electric Co that it was raising its 50-kvar units from $103 to $108. This spurred some activity among purchasers to get orders in before the new prices went into effect.

However, some calls around must have convinced them that the higher price wouldn't hold. During December, some utility men had made purchases at $103 with additional equipment thrown in amounting to an estimated 4% to 5% of the unit prices. Toward the end of December, one purchasing executive found 50-kvar units at $99, but no takers at $98.

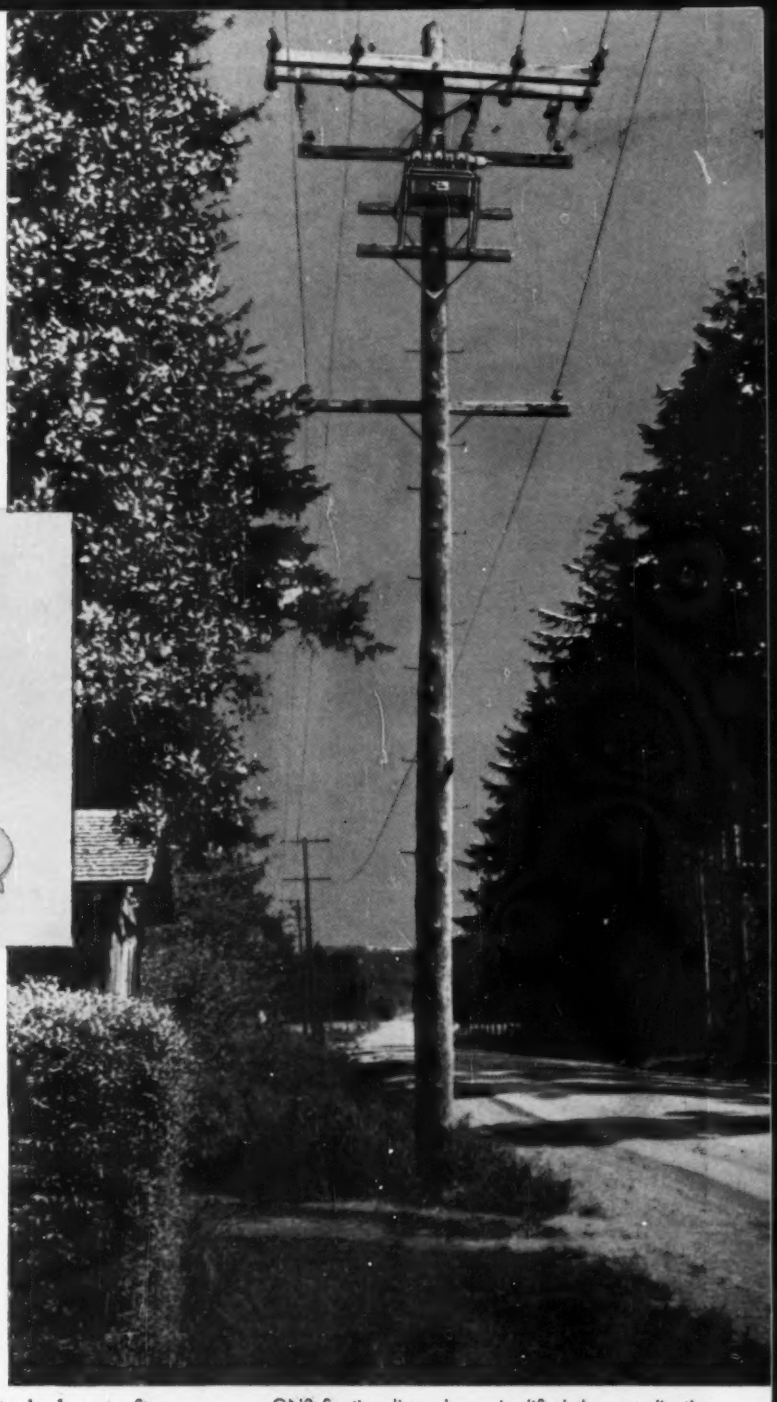
With manufacturing costs reported to be in the $100 range, it appeared that the manufacturers were sharing in a profitless spree. However, it appeared that most of them would go along with GE which slashed its published prices to $100 per 50-kvar unit as of Dec. 22.

One manufacturer to speak up was Sangamo Electric Co. In a terse telegram to *Electrical World,* Sangamo commented, "Greatly regret this manifestation of wavering price level in the industry. Stability and reasonable price levels can only be reached when management has the intelligence and fortitude to lose some current business in the interest of an adequate return for the long pull. No market price can be worth the name unless it is maintained for a reasonable period of time and is accepted by all buyers and sellers."

Puget Power Installs GN3 Sectionalizers For Automatic Protection Of 12.5 kv Line



L-M's three-phase GN3 Sectionalizer is available in twelve load-current ratings from 5 through 200 amperes at 2.4 through 15 kv, with a momentary current rating to 9000 amperes.



GN3 Sectionalizers have simplified the coordination of Puget Sound Power & Light Company's 12.5 kv distribution line. With the GN3 permanent faults are isolated and maximum service continuity is maintained.

Puget Sound Power & Light Company has simplified coordination of its 12.5 kv distribution lines by utilizing L-M's new 3-phase GN3 Sectionalizers. Now when permanent faults occur, they can be isolated and maximum service continuity will be maintained.

In some cases, in order to utilize the counting feature of the GN3, oil circuit breakers were replaced with faster operating L-M reclosers. Faulted lines are isolated by this GN3 sectionalizer after three operations of the back-up recloser or station breaker.

L-M's 3-phase GN3 is a self-contained heavy-duty sectionalizer. The GN3 operates only when the back-up recloser is open; therefore it interrupts no current. It may be set to lock out after one, two, or three operations of the back-up recloser.

Get Complete Information

Contact your L-M Field Engineer and learn how simply the GN3 can be installed on your line; or write for Bulletin CR6. Line Material Industries, Milwaukee 1, Wisconsin. In Canada: CLM Industries, McGraw-Edison (Canada) Limited, Toronto 13, Canada.

LINE MATERIAL® Industries

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482

Reclosers, Sectionalizers, and Oil Switches

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EW-19

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Milwaukee 1, Wisconsin

☐ Please send me Bulletin CR6 on the GN3 Sectionalizer.
☐ Please have L-M Field Engineer contact me.

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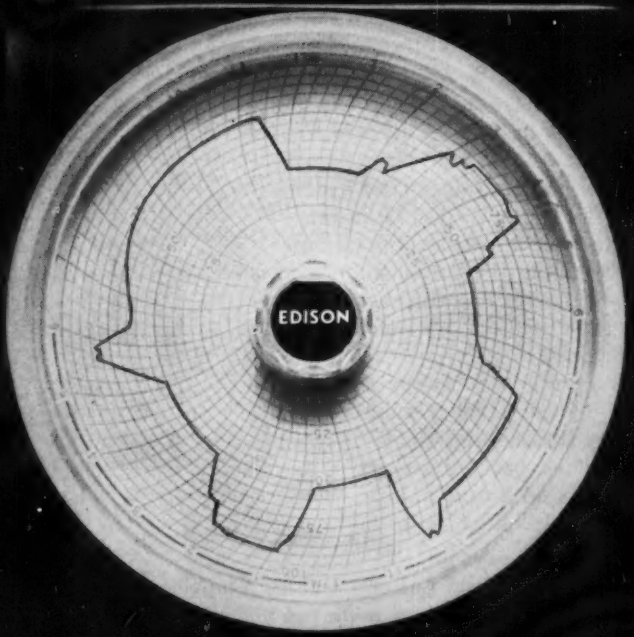
NEW
FROM EDISON



OMNICORDER

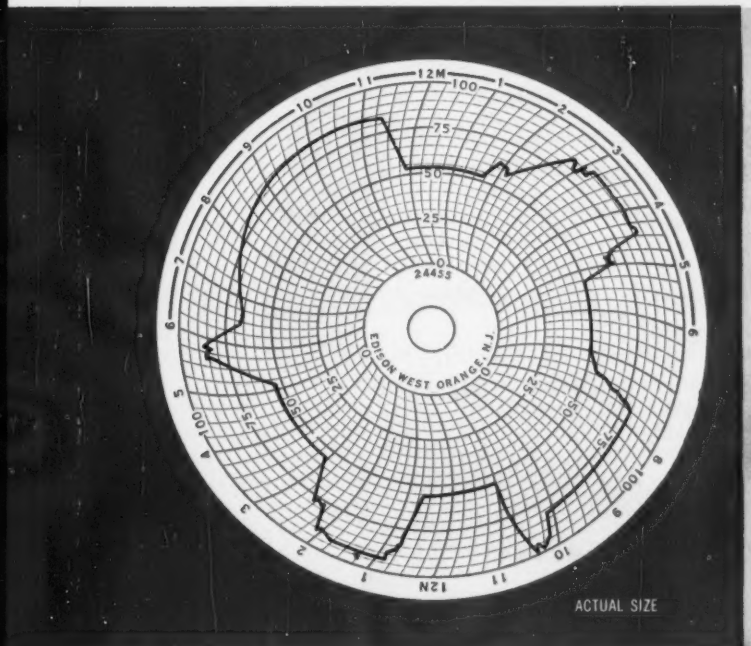
A PRECISE MINIATURE INKLESS RECORDER

■ INEXPENSIVE ■ REPLACES METERS OR INDICATORS ■ PANEL OR BULKHEAD MOUNTED
■ BUILT-IN VARIABLE CHART SPEED ■ JUST 3¾" X 3¾" X 3" ■ RECORDS ANY VARIABLE

Now you can take advantage of a new, economical means of recording any variable that can be converted to an electrical signal. Thanks to Omnicorder, you need no longer rely on meters or indicators, even where cost factors or space restrictions would ordinarily dictate the use of these instruments.

Measuring just 3¾" x 3¾" x 3", Edison's Omnicorder, a unique circular chart recorder, is so compact that nine units occupy just one square foot of space. Thoroughly legible, yet requiring no ink, pen or ribbon, Omnicorder is equipped with a simple three-speed chart adjustment. It provides a choice of these sequences: one hour, seven hours and thirty hours per revolution—or one day, seven days and thirty days per revolution.

Omnicorder's simple, inexpensive construction assures dependable operation and a long, maintenance-free life. Four types of meter movements are available to measure a wide range of AC and DC electrical quantities, ranging from thermocouple outputs to currents as high as 600 amperes with accessory current transformers. No amplification is ever required, even for signals as low as 10 microamps.



Stylus operates through this slot. The measuring system is sealed off from any careless tampering.
1 HOUR
7 HOURS
30 HOURS
EDISON
RECORDER
Zero Set Screw: Adjustment is made when measuring system is not printing and when the circuit to be recorded is disconnected.

For complete information on this rugged, maintenance-free Omnicorder, write for Catalog 3057.

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39 LAKESIDE AVENUE, WEST ORANGE, N. J.

CLAMP

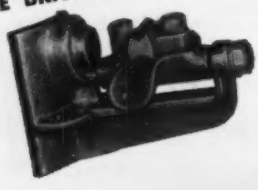
THE LAPP CLAMP IS INTERCHANGEABLE

Five sizes of clamps, in aluminum or malleable, each with reversible keeper, provide correct fit for all conductor sizes .25" to 2.00" dia. All clamps are interchangeable for use on

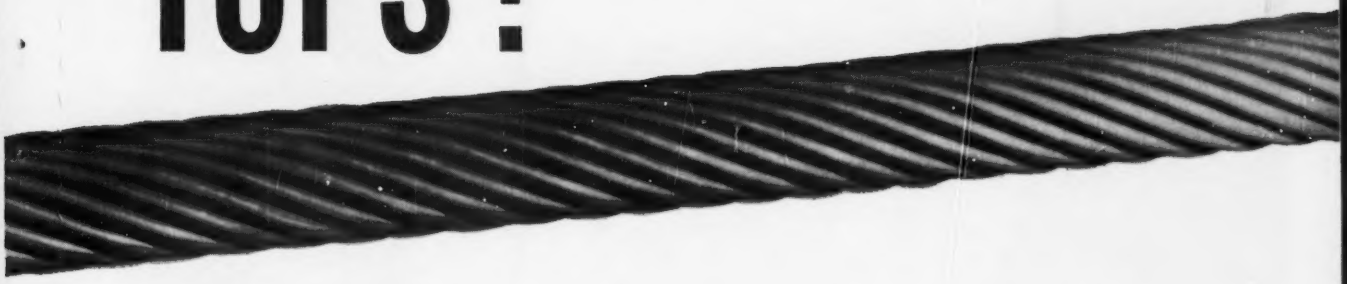
CLAMP-TOP LINE POSTS . . .

CLAMP-TOP LINE POSTS WITH INTEGRAL BASE-AND-GAIN FOR ARMLESS CONSTRUCTION . . .

CLAMP-TOP GROUND-WIRE BRACKETS



-TOPS?



THE LAPP CLAMP IS EASIEST TO INSTALL

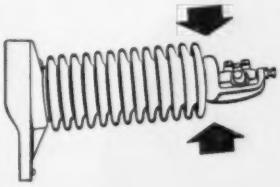
For original installation, insulator (or bracket) with clamp attached, is mounted to crossarm or pole. Keeper cap screws are loosened, and one removed. With keeper rotated out of position on remaining cap screw, conductor is dropped into place. Keeper is brought back to position, cap screw replaced, and both cap screws tightened. Cap screws have captive lock-washers so there is *only one loose part* per insulator throughout installation.

THE LAPP CLAMP IS EASIEST TO WORK WITH HOT-LINE TOOLS

No special tools required for insulator change-out. A trunnion cap screw is merely backed off, and conductor (with clamp attached) lifted out of position. The same clamp will slip into position in a replaced insulator and be secured by tightening trunnion cap screw. *No loose parts* throughout insulator change.

THE LAPP CLAMP-TOP IS MOST DEPENDABLE

A principle of Lapp Post design is the *external* attachment of hardware—*bases and caps*. This assures that the porcelain body be loaded only in large-area low-intensity compression. This design takes full advantage of porcelain's superior compression strength, and provides an assembly greatly more secure than one subject to the high-intensity tension loading introduced by internal pins and inserts.



Lapp

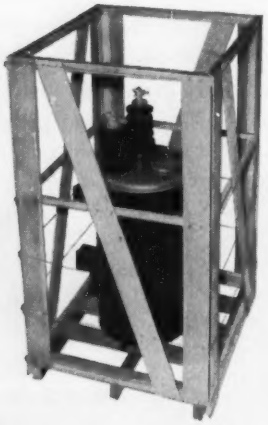
For new ideas on economical, efficient line and station construction read the new Lapp Catalog Eight. For your copy, write Lapp Insulator Co., Inc., Le Roy, N. Y.

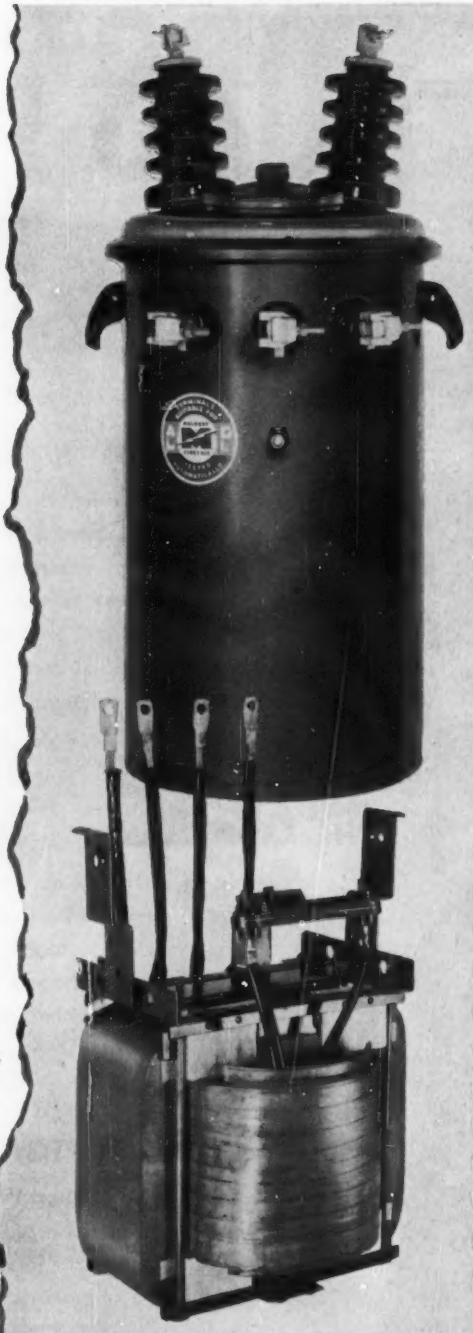
HAVE YOU A NOSE FOR NEWS?

Here's a scoop about the new

MOLONEY

Distribution Transformer





New features have been designed into the New Moloney Distribution Transformers. Compare these new transformers with competitive units. Decide for yourself where you will get the most for your transformer dollar.

NEW DESIGN FEATURES

1. New deep-drawn crowned cover—Smooth, rounded surfaced readily shed moisture and eliminate places where corrosive material can accumulate. The distance from the crown of the cover to the clamping band has been increased. This, when combined with the new Duracoat* Insulation, provides maximum protection against outages due to birds and other wildlife.

2. New cover internally grounded and positioned—(For Duracoat* Covers). A captive phosphor-bronze spring positions and automatically grounds the insulated cover to the tank, to prevent radio-frequency interference and eliminate shock hazards to linemen.

3. New cover clamping band—Designed to exert uniform pressure around the entire circumference of the cover. Clamping is done by a stainless steel bolt whose swinging hinge action permits ready removal of the cover. There is no chance of dropping parts of the clamp since all parts are captive.

4. New moisture shedding weep openings—Numerous weep openings are formed at intervals around the clamping band. These weep openings are so designed that water cannot be trapped in the band.

5. New single bolt handhole cover—Facilitates easy entry into the tank. Uniform pressure is exerted on the corprene sealing gasket by a captive internal bar.

6. New contour lifting hooks—Smoothly contoured hook underside prevents sling abrasion. Designed to permit use of cable or rope slings even on the smallest transformers without damage to bushings.

7. New hercules tank rim—Greater strength for tank top rim is obtained by rolling approximately 400 degrees. This increased resistance to distortion permits retention of the proved Moloney gasketing method.

8. New three-point core-and-coil suspension—Prevents pressure contact of Core-and-coil assembly with the tank bottom and thus achieves a reduction in sound level.

9. New high strength frame design—Maintains the superior eight-point blocking system for resistance to short circuit distortion.

10. New steel banded palletized unit—A steel band connected to the lifting hooks secures the transformer to the shipping pallet and thus facilitates handling by fork lift trucks.

11. New protective enclosure—Pre-tested and proved to be of great strength, the enclosure permits stacking. Easy to strip away when the transformer is to be installed, leaving only the palletized transformer.

PLUS THESE RETAINED SUPERIOR FEATURES

The Superior Moloney Core with inherently low exciting current —low core loss—low sound level • Low impedence design, resulting in improved voltage regulation • High short-circuit strength • High impact strength—liberal creepage bushings • Electro-tin coated connectors large enough to accommodate AL-CU conductors • Triple-thick tank bottom rim • Patented, automatic, electronic testing.

COMPARE COMPARE

So that you may decide for yourself... examine the design of new improvements... review the features which were retained ... compare all of the advantages of Moloney Transformers with competitive units. You will agree that these new improvements—combined with features that have been retained... add up to the best total value for your transformer dollar.

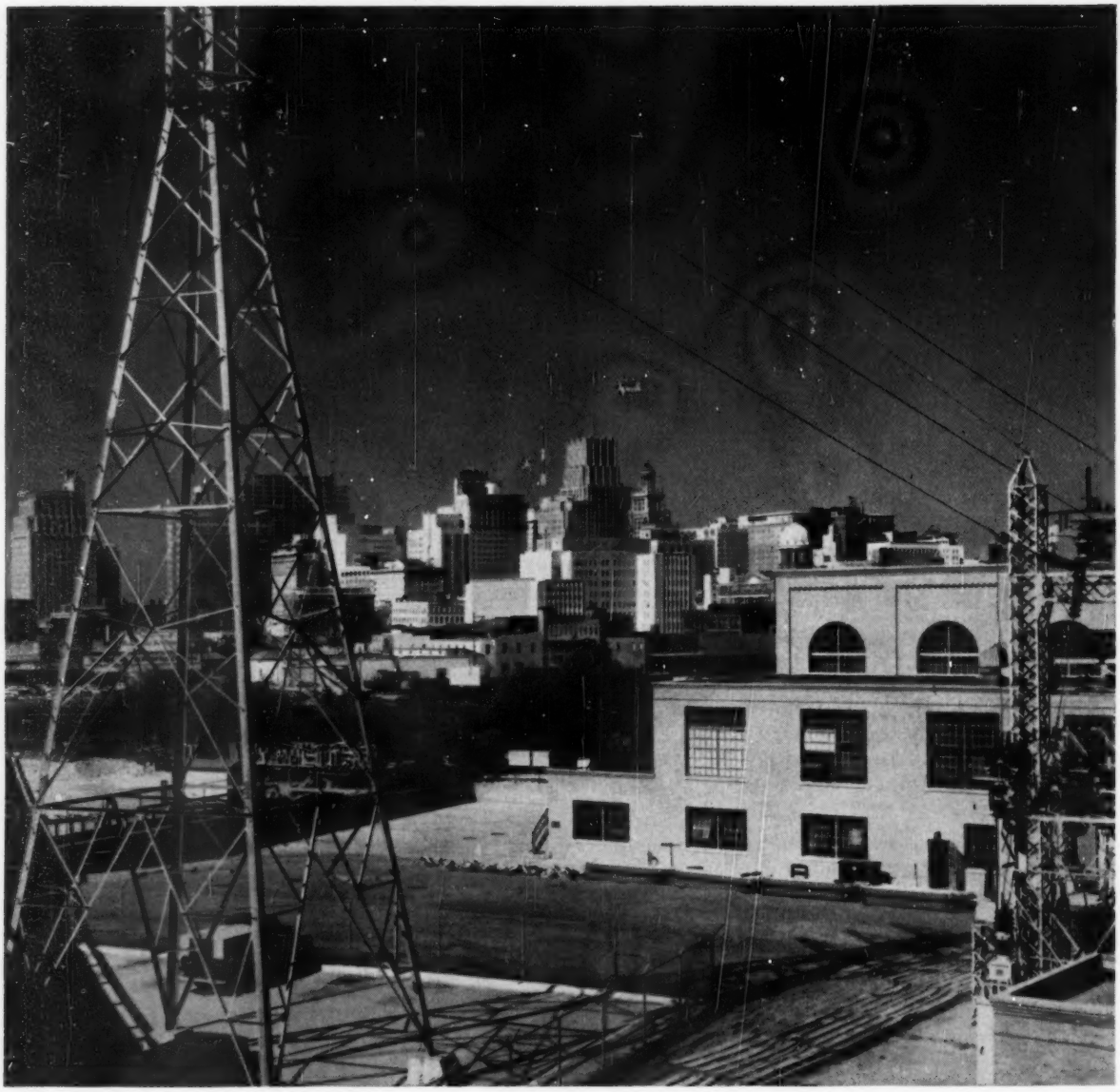
ME61-1

Since 1896... MORE POWER TO YOU

Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

MOLONEY ELECTRIC COMPANY

FACTORIES AT ST. LOUIS 20, MO., AND TORONTO, ONT., CANADA
SALES OFFICES IN ALL PRINCIPAL CITIES



Deep in the Heart

Dynamic, vibrant Houston, deep in the heart of the Texas Gulf Coast, is the South's largest city and sixth largest in the nation. Capital of the Republic of Texas little more than a century ago, it is now regarded by many as the U. S. petrochemical and petroleum capital. Surrounded by natural resources, it is also hub of the Southwest's industrial marketing, rice milling, cotton trading and processing.

The lively arts, education, museums, art galleries, parks, facilities for sportsmen, and temperate climate make the city a cultural and tourist haven.

Naturally, Houston has an enormous appetite for electric power and transportation—adequately served by an outstanding electric utility company, and six major and two terminal railroads. Their need for the highest quality insulated wire and cable has been, and is being, met by Kerite, under standards dating back to 1854—*a service that will continue and expand with the needs for quality cable.*

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Editorial Comment

JANUARY 9, 1961

EEI, NEMA Figures Show Continued Gains

Edison Electric Institute and the National Electrical Manufacturers Assn have released their year-end statements on business conditions in their respective fields. And despite the side-wise motions of the economy in general, the figures bear out the well accepted fact that the electric utility business is comparatively recession-proof.

For, says EEI, electric energy output in 1960 jumped 6.3% over 1959. And while this was less than was predicted a year ago, it certainly reflects the tremendous forces built into the use of electricity in this country. True, such a rate, if perpetuated, would find the industry falling slightly short of predictions that power will double over the decade. But our experience also indicates that years of relatively low power growth are succeeded by others which bring the industry back on its long-term trend line.

Substantiating EEI's report that utilities in 1960 added 7.7% to their generating capability, NEMA says that purchases for generation, transmission, and distribution equipment were up 3%. For 1961, EEI sees a further jump in generation of 6.5%, even though NEMA predicts a slight decrease in dollar value of shipments of generation, transmission, and distribution equipment of 3.5%.

Taking into account currently lower equipment prices, this means to us there is little pulling-in of utility horns in the year ahead. Clearly, all segments of the business are looking for an upturn in the economy during the last half to impose additional demands by industrial and commercial customers. And the inexorable rise in residential usage shows no sign of gross bending to economy winds, even though the rate has never measured up to potential.

These reports, from two of the industry's most valued sources, should do much to bolster any confidence which needs bolstering.

Another Inequality: Permission Granted

When a state legislature passes "permissive" legislation, subsequent action taken by the affected community agencies is fairly, if snidely, predictable. When the legislation permits a tax, the communities move to collect.

Thus, more and more school districts in New York State are utilizing legislation passed in Albany empowering them to impose a tax on certain utility customers in communities below a certain population level. Middletown is the latest to join Gloversville, Long Beach, Niagara Falls, Utica and Watertown in taxing users of electricity, telephone and telegraph services, gas, bottled gas, and water.

The Middletown authorities, concurrently with pressing for the tax, have admitted that it is "inequitable." Customers of Orange & Rockland Utilities, for instance, though side-by-side neighbors and equal users of either of the utility's commodities, are subject to the tax, or exempt from it, only by reason of the imaginary line bounding the school district. Furthermore, a resident heating his home with gas or electricity pays, but his neighbor burning oil does not. Commercial establishments are taxed; industrials are not. All of this is in accord with the permissive legislation.

But the crowning discomfiture is the law's provision that the utility company servicing the school district's residents shall again wear the tax collector's cap, while competing oil firms go about their business blandly unburdened.

Not all inequities in the utility business, it seems, are at federal levels.

Pacific P&L, Copco Will Merge

Pacific Power & Light could become important factor in north-south ties with northern California and Bonneville

Directors of Pacific Power & Light Co and California Oregon Power Co, after reaching the conclusion that it is in the best interests of both to join the two utilities, have reached general agreement on terms of a merger. PP&L would be the surviving firm.

Construction requirements of the companies in the next ten years are estimated at more than $500 million, which would nearly double present investment in plant.

The merger would result in a system serving 415,000 utility customers, including 242,000 in Oregon and 21,000 in the northern California area served by Copco's lines. About 65% of the business of the merged company would be in Oregon.

PP&L has annual revenues of $63 million and serves 323,000 customers in parts of Oregon, Washington, Idaho, Montana and Wyoming. Its power plants have a generating capacity of 779 Mw. Copco, with headquarters in Medford, Ore., has annual revenues of $25 million, supplies electric service to 92,000 customers in southern Oregon and northern California, and has 367 Mw of generating capacity.

About 400 Mw of additional hydroelectric development is pending on the two systems, which would increase their combined capacity to more than 1,500 Mw.

Transmission lines of the two systems are interconnected at a point south of Cottage Grove.

Subject to stockholder and regulatory commission approvals, the merger would be effected by an exchange of stock, it was stated. The two boards were reported to have agreed upon an exchange ratio of 1.2 shares of PP&L common stock for each share of Copco common.

Details of the proposed consolidation, including provisions for the exchange of preferred stocks, are to be worked out by a joint committee of the directors for submission to the 61,000 stockholders of the companies.

P. B. McKee continues as chairman of the board of PP&L and D. R. McClung as president. A. S. Cummins, Copco president, would become vice chairman of the PP&L board. Other officers of the two companies will serve as officers of the merger company and most of the members of the Copco board of directors would serve on the board of PP&L.

No Change for Employees

Rights and benefits of the employees of the companies, including retirement medical insurance and group insurance programs, will be recognized on an equal basis in the merger plan, it was stated. Little or no organization change effecting Copco personnel was seen at the present time.

Both PP&L and Copco have been carrying on large construction programs with expenditures totaling $243 million in the past five years.

Magnitude of their capital requirements of the 1961-'70 period, estimated at over half a billion dollars, was cited as an important reason for seeking to establish a broader-based utility operation.

Integration of the power resources of the two systems will help hold the line on future power costs, it was stated.

PP&L with headquarters in Portland has Oregon district offices at Albany, Astoria, Bend, Coos Bay, Corvallis, Enterprise, Hood River, Melscott, Pendleton, Springfield, The Dalles and Tillamook. It has other district offices at Yakima, Sunnyside, and Walla Walla, Wash.: Sandpoint, Ida., Kalispell, Mont.; and Casper, Laramie, Rawlins, Tiverton and Worland, Wyo.

Copco serves Medford, Grants Pass, Roseburg, Klamath Falls and Lakeview. California communities on its system include Tulelake, Yreka, Weed, Dunsmuir, Alturas and Crescent City.

'Breakthrough' Reactor Performance High

Experimental Homogeneous Reactor II (HRE-2)—Oak Ridge National Laboratory's nominee for the economic breeder reactor which will lead to a breakthrough solution of long-term energy problem—is now operating at a power level of 2.6 Mw.

With its fluid uranyl sulfate fuel flow reversed, the homogeneous reactor's performance now is better than ever, according to A. M. Weinberg, ORNL director. In his annual "State of the Laboratory" address, Weinberg listed development of the reactor high on the list comprising the lab's primary mission.

Last November nuclear technicians at Oak Ridge patched two small leaks in a remarkable way in the inner tank core of HRE-2, enabling it to resume power operation after a shutdown period of several months.

The ticklish repair job was performed remotely under 20 ft of water which shielded workmen from a radiation atmosphere of 100,000 roentgens.

First in April, 1957, while operating at full power (5,000 tkw) and high temperatures, an oval shaped hole 1 in. wide and 1½ in. long developed in the reactor's inner fuel tank. Operating with fuel in both the inner core and the outer blanket tank—which contained the solution escaping from the core, a second hole later burned in the wall of the core, 1½ in.x½ in. Both were believed to be caused by flow conditions permitting collection of fuel concentrates to form "hot spots" on the tank wall surface.

Reactor operations are now aimed at improving fuel solution stability and the measurement of corrosion on core tank thickness. Also, Weinberg claims, advantages of the homogeneous fluid fuel reactor will now be demonstrated in the area of low maintenance costs, continuous refueling and removal of radioactive waters from the fuel solution.

ACRS Stalls Reactor Permit

The Atomic Energy Commission's Advisory Committee on Reactor Safeguards, in a safety report to AEC Chairman J. A. McCone, has balked at giving complete approval to Philadelphia Electric Co's 40-Mw advanced high-temperature gas-cooled reactor (HTGR).

The ACRS report expressed doubts about several key parts of the reactor's design concept which was prepared by General Atomic Div of General Dynamics. The ACRS action has the effect of suspending the request for a reactor construction permit, by Philadelphia Electric and 50 additional investor-owned utility partners financially supporting the project, on AEC's calendar of pending licensing actions. A construction start on the reactor, to be located at Peach Bottom, Pa., is behind schedule.

After considering the research-development program now being conducted by General Atomic in support of its design, ACRS conclusions were not all unfavorable, however, and its report noted that initial results of General Atomic's R&D work appeared satisfactory. But in its remarks to McCone, ACRS indicated it could not give full endorsement of the reactor project until additional information was developed by experimentation.

Many Questions Unanswered

"There are many questions that remain to be answered by the research and development program which is still in its early stages," the report states. "Several of these questions are in areas which could require major changes in the present design concepts and could conceivably change our early optimism. For example, the long term integrity of the graphite under the proposed design conditions, which lie far outside past experience with graphite, has yet to be established. Also, the experimental data required to determine that the fission products emitted continuously from the homogeneous fuel components can be collected, stored and disposed of safely have yet to be developed. A novel design is proposed for the control rod system, but the development is not yet sufficiently advanced to permit adequate evaluation of its reliability. The applicant has not provided either a secondary back-up safety system or an emergency coolant system, but has not yet established to the satisfaction of the committee that these systems are unnecessary. The relatively large assumed doppler coefficient has yet to be confirmed.

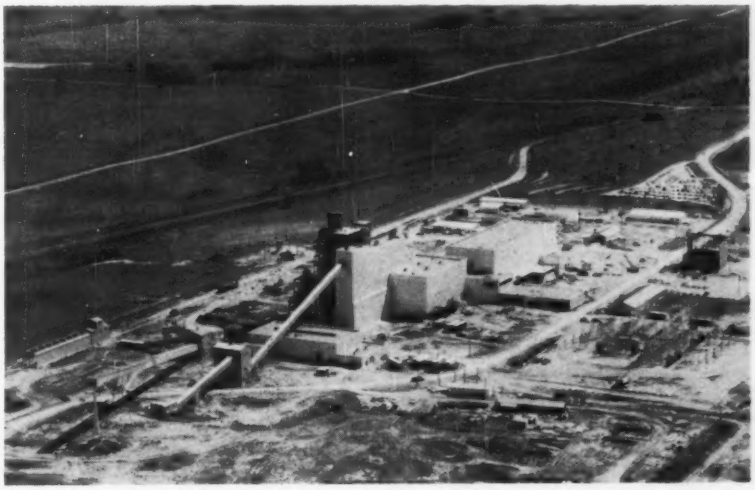
"In view of the foregoing, the Advisory Committee on Reactor Safeguards is not now prepared to go beyond its original conclusion reached in our letter to you under date of March 14, 1960, that the Peach Bottom site is suitable for a reactor of this general design and power level."

General Atomic officials have accepted the report as "understandable":

"This is what happens when AEC's licensing process catches your research program in midstream," one GA spokesman says. Meanwhile, assembly of a control rod drive tower to test out the reactor's radically new graphite-clad moderate fuel elements is proceeding.

Later the fuel elements will be subjected to six months of testing under irradiation conditions. "We understand that ACRS can't make its final judgment, until there's a little better proof that this reactor will work," the same GA representative says.

In accordance with a mandate imposed by Congress on the HTGR contract signed by AEC, if Philadelphia Electric and General Atomic fail to go through with building the helium-cooled reactor, AEC would then have to be reimbursed for its $14.5-million R&D grant to the project. If, however, the reactor is not built because proper licenses are not issued by AEC, General Atomic presumably would not be obligated to return the AEC expenditure which thus far has funded the General Atomic research program..



Nuclear and Coal Plants Side-by-Side

Nuclear and coal plants go up alongside each other near Hallam, Neb., for Consumers Public Power District. Work on the 75-Mw sodium-cooled, graphite-moderated reactor plant, which will occupy the long hall at the upper right, is about 50% complete. The nuclear reactor owner is the Atomic Energy Commission, which also built its forerunner, the Sodium Reactor Experiment near Los Angeles. Completion is due in 1962.

EEI Sees Ten Years of Growth

If present plans pan out, investor-owned electric companies will have doubled their 1960 production by the end of 1970. And by 1980, capability and production will be four times the present figures.

This forecast comes from Sherman R. Knapp, president of the Edison Electric Institute, in a report which traced the performance of the electric power industry in 1960. "During 1960," said Knapp, "a year in which the American economy as a whole followed a somewhat uneven path, the electric utility industry continued its record-making growth, substantially advancing toward the level of power-producing capability expected by the end of the decade."

The EEI president cited preliminary figures which indicate that electric energy output in the contiguous US reached a record high of 764.8 billion kwhr in 1960, a 6.3% increase over 1959. When generation by industrial plants and railroads not contributing to the public supply are added, and generation in Alaska and Hawaii is included, 1960's output is approximately 850 billion kwhrs.

Capability during the year reached almost 176 million kw, a 7.7% increase over 1959 giving the contiguous US a 25.5% margin of capability over estimated annual peak. This margin is more than the total electric power-producing capability of the nation in 1935.

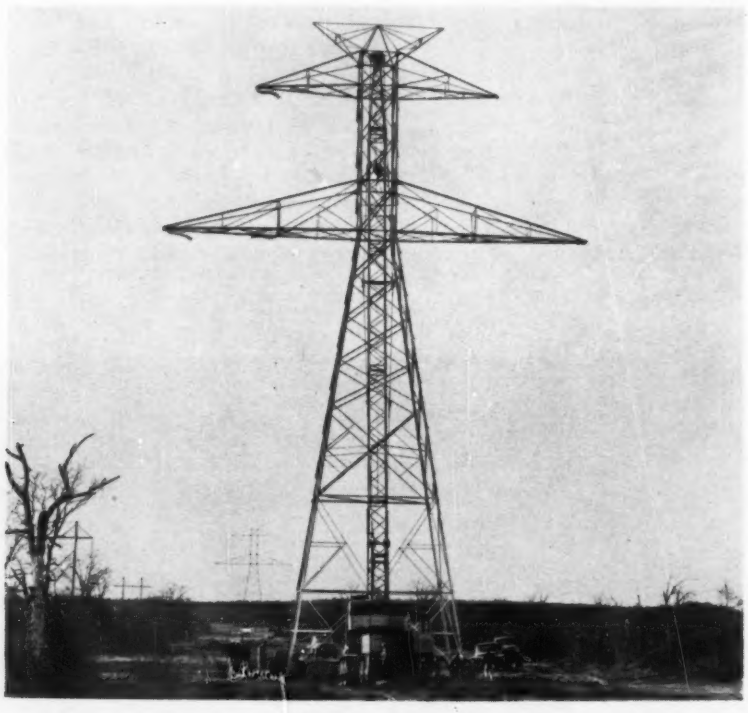
Knapp's report indicated that the US lead in power production over the USSR is continuing to increase. During 1960, the Soviet Union added 7.5 million kw to capability bringing the national total to 66.6 million kw. At the same time, the US increased capability by 12.6 million kw and increased its lead over the USSR to 127.3 million kw of capability. The significance of this lead is highlighted by the figures for per capita usage of power. Every man, woman and child in America used an estimated 4,716 kwhr in 1960. Soviet citizens used only 1,322 kwhr per person.

Nuclear Power Continues Gains

Nuclear power continues to make gains in the field, undergoing exhaustive research with each step of its development. No less than 132 electric power companies are participating in one or more of the 26 major projects for development, construction of atomic power plants.

In looking toward the future, Knapp pointed to 1961 as another banner year. During the year, electric companies plan to add about 7.5 million more kw of generating equipment. Governmental agencies will provide another 3.8 million kw. This combination will raise the capability in the contiguous US to 187.2 million kw, boosting it by 6.5% over 1960.

By the end of 1961, electricity output in the United States, including Alaska and Hawaii will be 910 billion kwhrs, 7% ahead of '60. The number of customers is expected to increase to 59.8 million by the end of the year, with sales reaching 715 billion kwhrs for a 7.2% increase over the 1960 record. This will increase the revenues of the investor-owned companies by about 6.8%, putting the 1961 figure in the vicinity of $12¼ billion.



TESCo Plans for 345-Kv Line

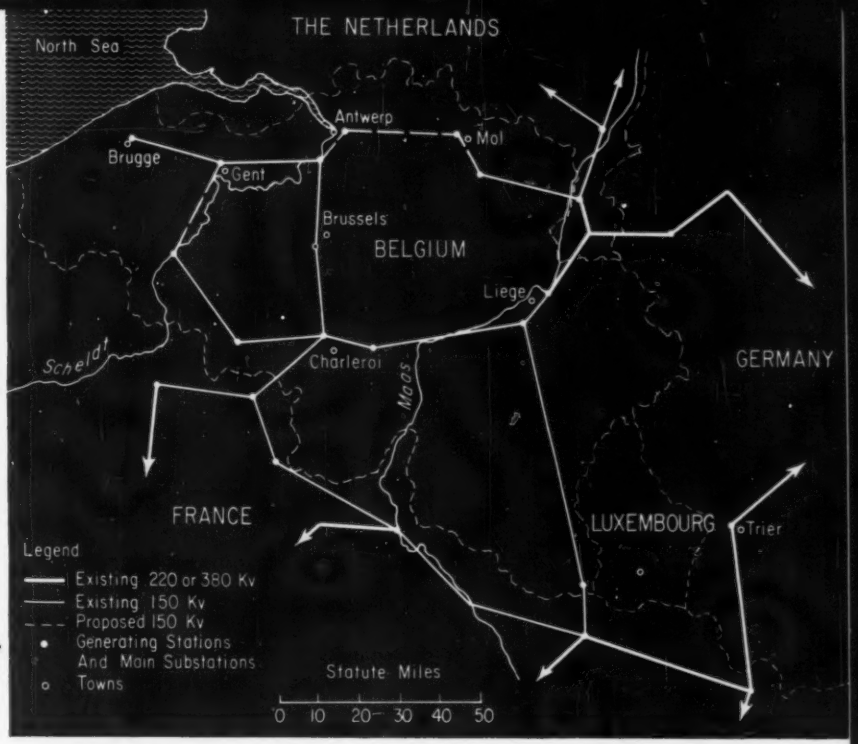
A double-circuit 138-kv line, designed for ultimate operation at 345 kv, is being built by Texas Electric Service Co. The 95-mile line will reinforce the transmission tie between TESCo's new Graham Station and the Ft. Worth area.

Towers in the line will be from 102 to 132 ft tall; average tower weight is about 13,000 lb. The bottom arm of each tower will measure 68 ft over-all, to provide an 18-ft spacing between phase conductors and 13-ft clearance from the inner phase conductor to the tower leg. Each tower base will form a 25x12½-ft rectangle.

Spans in the line will average about 1,000 ft. At present only one 138-kv circuit of 795-MCM conductor will be installed. For operation at 345 kv, the conductors will be bundled.

Belgium Considers 380-Kv Ties

Switch from 150 kv would put Belgium on par with French and West German grids, and advance European intertie



EUROPEAN INTERTIE connects Belgium to neighbors. Besides 380-kv lines now built, plans call for 380-kv lines into Holland, and to Belgian border

Power system planning in Belgium today is taking on a more international flavor. Belgium's main network has long been intimately tied to those of the neighboring countries of Netherlands, France, Germany, and Luxembourg. But the voltage of the Belgian grid is primarily at 150 kv except for a 220-kv link between Liege, Germany and the Netherlands. This isn't the case in other parts of Europe.

Connections between France and Switzerland, and Germany and Switzerland, have been stepped up to 380 kv, and new ties at this voltage are planned between the Netherlands and West Germany. A 380-kv line from Paris to the Belgian frontier is projected.

Now, it appears that Belgium, too, will move in this direction. Roger Paquet, the director general of the Professional Federation of Producers and Distributors of Electricity in that country, stated that reinforcement of Belgium's international connections is now under consideration. He added that most probably the voltage for these reinforcements will be 380 kv. European experts at the recent World Power Conference in Madrid favored this level for regional interties throughout Western Europe.

The map above shows the present connections of Belgium with its neighbors. These include connections to the Netherlands through the line Eisden-Lutterade and Jupille-Lutterade, to Germany through Jupille-Brauweiler, and to France and the Grand Duchy of Luxembourg through the line Gouy-Maubeuge and Aubange-Landres. It is these lines which will probably be reinforced to the 380-kv level.

In Belgium itself, the grid consists of two main loops, running east and west, and joining in the middle along the Antwerp-Brussels axis. The study, construction, and management of this transport network are centralized in the hands of one company called "Gecoli." The electric power industry in the country, coordinating privately owned companies, industrial power plants, and government agencies, supplies 3,500 Mw to the nation's nine million people.

The power stations, 98% of which are thermal units, are privately owned except for two municipalities whose units represent 3% of the total production. Due to the importance of the coal and iron and steel industries, industrial power plants represent an important share in total electricity generation, producing 43% of the total supply.

Public agencies handle the bulk of Belgium's distribution. Local public authorities supply 30% of the population, and the "Intercommunales Mixtes," a system where public and private interests join together, handles another 58%. Private enterprise, although generating nearly all the power, distributes only about 12%.

To facilitate planning, the privately owned companies of the public services are organized in a "Comité de Gestion" which seeks to coordinate at the national level the policy of these enterprises. In important matters, decisions of this committee are binding on all its members. The activities of the committee are supervised by a "Comité de Controle" which is composed of government officials and representatives of the industrial consumers and trade unions with the government exercising general control.

Present planning of the Belgian Federation of Producers and Distributors of Electricity indicates that during the period 1959-1963, 1,600 Mw of new capacity will be installed. Most of the new capacity will be generated by 115 to 125-Mw units. In the period 1964-1968, 250-Mw units will be used to provide another 1,200 Mw.

James Landis Gets Staff Job

James M. Landis will move into the White House late this month to guide the Kennedy Administration in reforming the Federal Power Commission and other government regulatory agencies.

Kennedy gave Landis, an old friend and former New Dealer, the White House appointment shortly after Landis submitted to him a report blasting the agencies for inefficiency, ineptitude and, in some cases, bias.

Landis had suggested that the President-elect create within the executive department a permanent "office for the oversight of regulatory agencies." This official would be a White House czar who would ride herd on the agencies, spurring them to speedy decisions and making sure they adhere to broad administration policies.

But Kennedy did not—at least for the present—fully buy this proposal. He gave Landis the less permanent and less sweeping title of "special White House assistant to prepare a program of reform for federal regulatory agencies" and said there had been no decision as to how long Landis would remain in the White House.

Landis will still stay on until he has drafted a program for submission to Congress on reorganizing the agencies, and until he has helped Kennedy select men to fill existing vacancies on the commissions.

In his new job, Landis is expected to concentrate first on getting Congress to reactivate the now-expired 1949 Government Reorganization Act. He would then move swiftly to submit an array of proposed changes in agency organizations and operations.

Landis is expected to make these specific recommendations for revamping the FPC:

- Increase its membership from five to seven so that more commissioners would be available to help clear up its backlog of cases. Landis has said the Commission is so far behind in its work it is the prime example in the government of a breakdown in the administrative process.
- Make clear that the chairman of the FPC is to be designated by the President and shall serve only at the pleasure of the President. The chairman's authority would also be strengthened to give him control over all administrative matters within the agency and control over the budget.
- Propose that single commissioners, panels of members and even hearing examiners in minor cases be empowered to render final decisions. The full Commission would have discretionary power over whether to hear appeals and would accept on appeal only cases of major import.
- Lengthen the terms of FPC members and members of all other regulatory agencies. Landis has not settled on a specific figure but is thinking in terms of ten years. He feels more qualified men would accept agency appointments if assured of more tenure.

Within the Kennedy Administration itself, Landis will pursue two other goals:

- He will survey the agencies' budgetary needs and try to see that they get enough money to operate without a false sense of economy. Among other things, he will propose that agency members be given entertainment allowances and improved retirement allowances.
- He will use his influence to see that men selected to fill agency vacancies are experts in their fields.

Kennedy will be able to fill two spots on the FPC as soon as he takes office and another in June. Selecting Democrats for these posts will give him a 3-2 majority on the Commission.

The posts up for immediate appointment are those of Republican Paul Sweeney and the now-vacant seat formerly held by William Connole. The term of Vice Chairman Arthur Kline, a Republican, expires in June.

Peace-Columbia Investigation Ordered

In a surprise move Dec. 30, Premier W. A. C. Bennett signed over the entire Peace-Columbia hydro development program to the British Columbia Energy Board for investigation.

Bennett's order instructed the Board that a definite price of power laid down to consumers from each source must be part of its findings.

Bennett was at his home but Attorney General Robert Bonner described the inquiry as ". . . probably the most important investigation ever undertaken in BC."

The order said inquiry is to be held because "Conflicting views are entertained publicly as to costs of and benefits to be derived from each project, and more particularly as to cost of electricity to the consumer in each case."

Other aspects the board is instructed to report on are: information on which costs are determined; at-site cost of power from each project, including downstream benefits; transmission costs to Vancouver, and information on which these figures based; cost of standby facilities for each project; extent the "two projects may be related to one another, if at all, and if complementary in this relationship; and the legal and economic conditions under which complementary development may take place."

Commented Bonner: "The order expressly excludes political opinion and deals with engineering information and matters of fact. There has been far too much loose talk in BC about the two projects in terms of cost and benefits, and too little in terms of engineering."

Board chairman is Dean Gordon Shrum of University of BC; Arthur Paget, water rights comptroller; Dr Hugh L. Keenleyside, chairman of the BC Power Commission, which will develop the Columbia (Keenleyside also is Bennett's adviser on resource development); Dr H. F. Angus, chairman of the PUC, which must approve the Peace project before it can start, and James Sinclair. The order demands interim reports to the cabinet from time to time.

News Scope

BALANCE OF POWER—Republican control of the California Public Utilities Commission will be broken shortly when Gov Edmund G. Brown appoints Democrats to replace two commissioners whose terms expired Dec. 31, 1960. For the first time in his two years in office, Brown will have a majority on the five-man regulatory commission.

GETS EXEMPTION — Electric Bond & Share Co has been exempted from the Public Utility Holding Company Act of 1935. The Securities & Exchange Commission issued its findings and opinion and order granting the company's application, filed in 1955, to register as an investment company under the Investment Company Act of 1940, subject to certain conditions which reduce Electric Bond & Share's ties to United Gas.

RATES & REGULATION—Hawaii PUC has authorized increased rates for Honolulu Gas Co to permit the company to normalize federal income taxes under Sec. 167 of the Internal Revenue Code. However, the Commission required the tax reserve to be deducted from the rate base. In view of the current controversy over whether normalization of taxes results in a temporary deferral or in a permanent reduction of taxes, the following excerpt from the PUC order is of interest:

"This Commission is unwilling to have the tax deferment savings passed on to the stockholders and then, at the close of the tax deferment period, have the rate payers foot the bill for the higher income taxes. Thus, this Commission has adopted a normalization plan to maintain uniform customer rates through normal income tax depreciation and the creation of the Deferment Tax Reserve to meet the expected payment for the deferred tax future payments. Under these conditions, the Reserve becomes a deduction from the rate base."

CONDEMNATION — Glasgow, Ky., has filed a condemnation suit to take over Kentucky Utilities Co's local system. The move, authorized by voters in November, followed an Appeals Court denial of a KU petition for rehearing of a decision upholding the election-call's legality. A City Electric Planning Board spokesman suggested that the city could begin distributing TVA power through the system within a few months, depending on how quickly the court acts on the condemnation suit.

SETTLE AREA DISPUTE—Ending a long legal battle before the state Public Service Commission, public and investor-owned utilities agreed to a division of service areas in northern Mississippi. Mississippi Power & Light Co and North Central Mississippi Electric Power Assn agreed to buy from each other certain facilities in DeSoto, Tate, and Marshall counties.

SELLS 22 FACILITIES—Central Electric & Gas Co, Lincoln, Neb., will sell electric service facilities of 22 communities. Northern States Power Co will buy facilities to 12 South Dakota communities, making the facilities part of its Sioux Falls, S. D., division. Northwestern Public Service Co, Huron, S. D., will buy electric facilities in ten other communities from CE&G.

PLANNING AHEAD—American Electric Power System will hold two College Faculty Conferences Jan. 11-12 in Canton, Ohio, and Feb. 8-9 in Roanoke, Va., to stimulate interest among college engineering students and graduates in careers in the AEP System. About 200 representatives of 36 major Midwestern and Southern technological schools have been invited. AEP President Philip Sporn will address both gatherings.

Dateline . . . Electric Utilities, USA (*Continued from page 5*)

their production, or to hurt their research," he concluded.

Some local public utilities indicated that the key to their possible actions will hinge on the cooperation of the Justice Department in supplying evidence gathered over the past several years.

One official said: "Proving damages is an awfully tough proposition. If Justice makes available the evidence and even goes ahead and prosecutes the damage claims for us as well as the claims for the federal government it will enable us to ride along on the (Justice) Department's coattails and save us the thousands of dollars it would take for our own investigations."

The American Public Power Assn is preparing a memorandum for its members that will explain the area open for damage claims.

Tennessee Valley Authority, the agency largely responsible for the government investigation, says it is still undecided as to what action to take.

It is known that the government has actively engaged in encouraging states and local public agencies to carefully examine their purchases over the past several years to determine whether they might be entitled to damages. No suits have been filed as yet, however.

The Justice Department is considering filing damage suits on behalf of government agencies, but again, none have been filed. The agencies might be defense organizations, Bonneville Power Administration, Bureau of Reclamation, and others. The status of TVA in this regard is still in doubt because of its ability to finance itself.

A Justice Department attorney said ". . . quite a few states are interested in filing," but added that none have done so yet.

Atomic Industrial Forum speakers . . .

Discuss Industry and

HOLIFIELD: US must lead the world. Decisions must be faced, not delayed

McKINNEY may be next AEC head ▶
CHARLES H. WEAVER (right) of Westinghouse is new AIF president

■ Debate over the roles of government and industry in the continuing development of nuclear energy highlighted the Atomic Industrial Forum (AIF) Dec. 14-16 in San Francisco. Nuclear safety, the Atomic Energy Commission's licensing procedures and the organization of that body also came in for broad appraisal.

Rep Chet Holifield (D-Calif.), incoming Chairman of the Joint Committee on Atomic Energy, blamed the Eisenhower Administration for causing America's atomic energy program to lag in favor of a balanced budget. He said the AEC for several years had been held down to spending only about half of the $400 million annually approved by Congress for research, development and construction of associated facilities. In the field of nuclear energy, budget considerations are secondary to survival, he said.

Holifield had no new programs to offer in his speech, which he gave before a joint session of the AIF with the American Nuclear Society. He emphasized, however, that additional federal assistance will be required for other than water-type reactors if those types are not to die on the vine. Aware of the controversy that the question of private vs government financing can arouse, Holifield said, "I am willing to be open-minded. I only ask that the decisions be faced, not neglected. If new starts are in order, I only ask for sensible finance plans."

Holifield also urged that safety questions be brought out on the table and into candid public discussion. He urged that money be as willingly spent for safety engineering in reactor projects as it is for lawyers and public relations experts.

On the role of AEC laboratories, Holifield emphasized their importance and said these should remain fixed and permanent national institutions with the ability to make a massive assault on advanced scientific problems. Industry automatically benefits from their pioneering efforts. "I by no means downgrade the role of industry," said Holifield. "We on the Joint Committee want to encourage a growing, healthy and competitive atomic industry."

Robert McKinney, publisher of the *Santa Fe New Mexican* and a possibility for the AEC chairmanship, agreed that the AEC laboratories today are vital national assets. The laboratories are an effective means for integrating the scientific and technical capabilities of the nation through their complementary position with respect to the universities on the one hand and industry on the other.

"How is the research and development workload of the government's various peaceful atomic programs to be divided between the laboratories of government, industry and the universities?" Public policy, asserted McKinney, must set "low-cost atomic power as a primary objective and the broader benefits of atomic research as collateral objective, undertaking accordingly the proper and major role of government through:

- "Attack on the frontiers of atomic science and technology;
- "Development of experimental and prototype atomic power plants transitional to the achievement of low-cost atomic power; and
- "Development and utilization of atomic power plants which can be presently economic, in the sense of fulfilling unique purposes. These include reactors for power and pro-

AEC Roles

pulsion in special situations such as outer space, underseas, and in the Arctic and other inaccessible regions."

Francis K. McCune, outgoing Forum president and General Electric vice president for engineering services, called for a stepped-up industry role. He pointed to the area of research and development as critical. Industry is faced with the fact that the AEC is continuing to put the major portion of its R&D dollars into its own programs. "Government-owned laboratories are still growing, yet the ever present possibility that weapons work will diminish could drain the AEC R&D till dry in an effort to sustain these laboratories at their present level of operation." Another factor is the potential limit on future atomic appropriations because of the shifting attention of Congress from atomic energy to more pressing space problems. These situations, he warned, call for "renewed activity on the part of industry to compete for AEC R&D funds, co-operative programs," and in areas where "there are fewer long-term commitments to support government laboratories and reactor activities." More emphasis should be placed on long-range planning in order to work out programs with policy-making AEC people well in advance of the time work is to be performed.

McCune also called attention to licensing procedures which he said have been permissive rather than regulatory. It is the industry's responsibility to develop common safety standards which can be applied to design specifications and operational procedures and to have these standards accepted by the governmental regulatory agency. "Only then," he said, "will we be able to shed the cumbersome process of obtaining prior approval from the AEC for construction and operation of nuclear power installations."

In an effort to contribute to public acceptance of atomic energy, the AIF has formed a committee headed by Oliver Townsend, director of the New York State Office of Atomic Development. In spite of an impressive safety record for nuclear industry, there continues to persist a lingering doubt on the part of the public concerning the potential effects of a nuclear incident. Nothing would aid public understanding of atomic energy, said Townsend, more than full blown public debate on the national policy question of how much risk it is reasonable to take in order to gain the benefits that atomic activity to date reasonably promises.

Such debate might focus on public hearings by the Congressional Joint Committee on Atomic Energy, which wrote the law and thereby defined the objectives toward which all those in the atomic community are now presumably working. It now may be a good time to get this subject out on the table in the hope that some logical guidelines can be produced so that everyone who is engaged in and dedicated to atomic development can have a reasonably firm basis from which to function. There is an overriding need to know whether it is possible to contain a nuclear reactor to the point that it can be placed in any location, or whether reactors must inherently always seek remoteness.

AEC Procedures Criticized

Looking to the time when the nuclear industry will supply a substantial percentage of all new power plants, Fritz F. Heimann, counsel for General Electric's Atomic Power Equipment Dept, pointed out that the present case-by-case review system will become an intolerable bottleneck. At that time, regulation by published standards will be a necessity. These must be guides rather than inflexible limits, he emphasized. Experience shows that the only significant issues in the reactor licensing process are the safety issues. Where there is no intervention and where safety matters have been resolved to the satisfaction of the staff and the AEC's Advisory Committee on Reactor Safety (ACRS), no contribution is made by the ritualistic observance of procedural formalities.

Heimann further suggested that, in view of the limited time members of the ACRS have for that job, that body should be given discretion to decline jurisdiction or to confine its review to specific questions in an application.

Attorneys William H. Berman and Lee M. Hydeman, who are directing a study project on AEC organization at University of Michigan Law School, concurred that the ACRS review function should be merged into the AEC hearing process, leaving ACRS free to evaluate research. The tendency of the ACRS to act more and more like a separate regulatory body, undertaking its own detailed and independent analysis of each proposed project, has increased the burden of the regulatory process significantly, said Berman. A practice has developed of requiring that full power operation be approached in steps of gradually increasing power levels, which seems perfectly reasonable. What does not seem reasonable is the requirement that data developed at each interim step of test operation be received in evidence at a formal hearing. It would be more reasonable to permit the AEC's hazards staff to determine whether the safe operating parameters were met.

Berman noted a "tendency on the part of the Commission to insulate itself from the decision making function and, thereby, to neglect its obligation to assist industry by developing policy guidelines in the area of reactor safety." One explanation "is that the burden of the total responsibilities of the commissioners is too great to permit them to devote adequate time to regulatory problems." Another is "that self-consciousness about their combined promotional and regulatory functions has led the commissioners to shy away from more active participation in licensing matters."

The Michigan Law School study suggests that the AEC be split into two agencies. An Atomic Energy Administration headed by a single executive would be responsible for conducting AEC's operational and promotional functions, and an Atomic Energy Board would assume the present safety regulatory functions of the Commission.

T. C. Runion, W. R. Grace & Co, reported that spent nuclear fuels can be reprocessed in a privately-owned plant with 1-ton-per-day capacity

(*Continued on page* 66)

Regulator

Time delay integrated with

M. W. GANGEL, Application Engineer, Electric Utility Engineering Operation,
E. E. WEJMAN, Product Planner, Voltage Regulator Production Section, General Electric Co, Schenectady, N. Y.

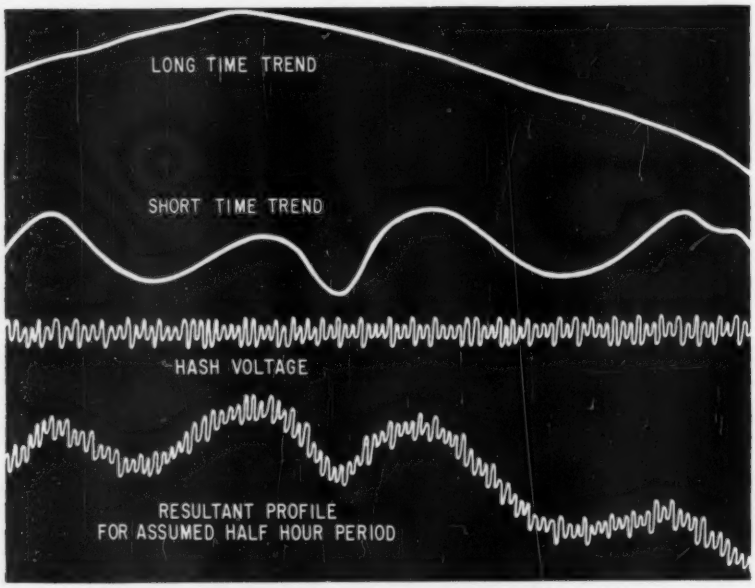


Fig 1—Voltage Profile for Utility Distribution Feeder

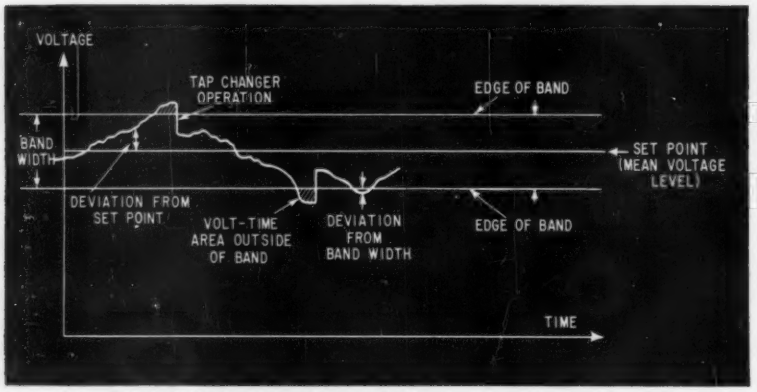


Fig 2—Regulated Voltage Characteristic

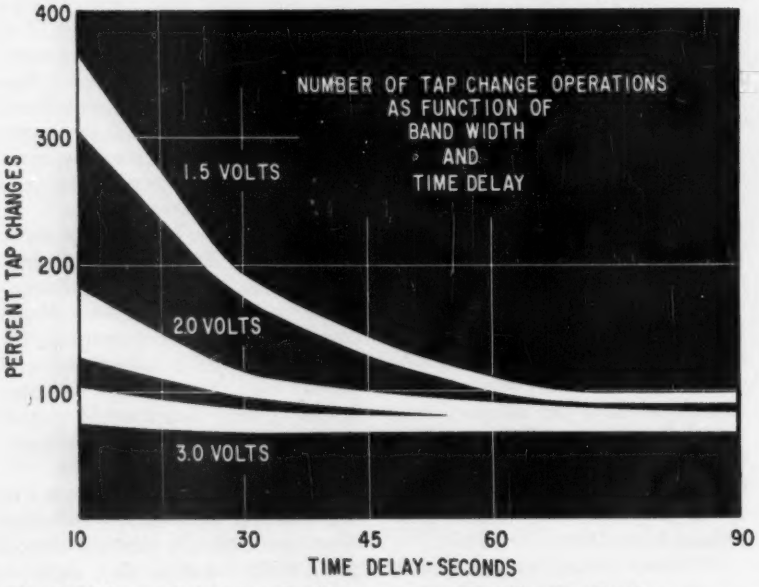


Fig 3—Voltage Regulator Performance on Distribution Feeders

Many regulators in service today can be used more effectively in controlling system voltage. This is demonstrated by tap-change counts as low as 5,000 and averaging 15,000 to 20,000 per year. With contacts proved by test to be capable of 1 million operations at full rated current, closer voltage settings are justified. Performance data are needed to predict the consequent increase in regulator operations.

To what degree are minimum practical bandwidths used today?

A series of surveys covering 96 utilities revealed specified settings for bandwidth are as follows: 1½ and 2 volts—39% of mentions; 2½ and 3 volts 48%; 4 to 6 volts 13%. The survey data are considered representative of bandwidth settings made today on modern step regulators and indicate that 61% of the regulators in use are set for 1 to 4 v wider bandwidth than the practical minimum.

The reason usually given for setting bandwidths greater than 1.5 v is avoidance of excessive operations. This precaution may have originated from basic conservatism or distrust of older equipment. But adherence to it stems from resistance to change and lack of quantitative information on the effect of bandwidth reductions on regulator operations.

Voltage charts were taken at ½ in. per min with the voltage zero suppressed to give full-scale deflection for a 12-v variation on typical distribution feeders. These charts show that voltage profiles have three basic components (Fig 1):

1. A long-term trend, rising and falling in inverse relationship to the load. (The traditional concept.)

2. A superimposed short-time cyclic variation of 1 to 1.5 v magnitude and 2 to 5 min period which is primarily responsible for regulator operations.

3. A superimposed hash of about 0.5 v and 10 cpm frequency which

Bandwidth Key to Voltage

bandwidth setting gives acceptable operations and better customer service

has little effect upon operations.

The effect of such voltage variations on a regulator was then studied, using an electronic analog computer set to simulate a regulator in every operating detail. Its output (Fig 2) shows the regulated voltage, with tap changes indicated by abrupt changes in the voltage trace. Changing the computer to simulate different bandwidth and time delay settings permits a comprehensive analysis of a regulator's operations for a given voltage input.

An arbitrary base of 2-v bandwidth and 30-sec time delay on a 32-step regulator was selected as the reference (Fig 3). Cutting the bandwidth to 1.5 v almost doubled the operations; extending the time delay to 60 sec brought operations with the reduced bandwidth back almost to the reference base. Thus time delay controls the number of tap changes; for this case it would permit a 1.5-v bandwidth (±¾ v) without an increase in the number of operations.

The computer also applied two tests of voltage quality. The first was the integrated volt-seconds deviation from the desired value of regulated voltage. Deviation on the high side was considered positive; that on the low side negative. Positive and negative readings were permitted to cancel. Average deviations over most segments of the load period proved negligible. Maximum (instantaneous) deviations were small and, for a time delay of 30 sec or longer, not a function of time delay but of input voltage variations (Fig 4).

The second measure applied to voltage quality was the integrated volt-seconds outside the set bandwidth, divided by the total load time. This determines the effective bandwidth and reflects the effect of increased time delay. But, as shown in Fig 5, it does not exceed 0.05 v. A more severe test, dividing volt-seconds outside the band by the actual time the voltage was outside the band to get the average deviation during periods of deviation, gives values of 0.15 to 0.3 v. These are still insignificant.

A conservative conclusion is that an increase in time delay affects voltage quality by a very small and almost random amount which is considerably less than the gain in quality from a corresponding reduction in bandwidth.

Better regulated voltage makes for better customer service. When this better service can be achieved at essentially no expense by optimizing the control setting, there is little reason not to offer it.

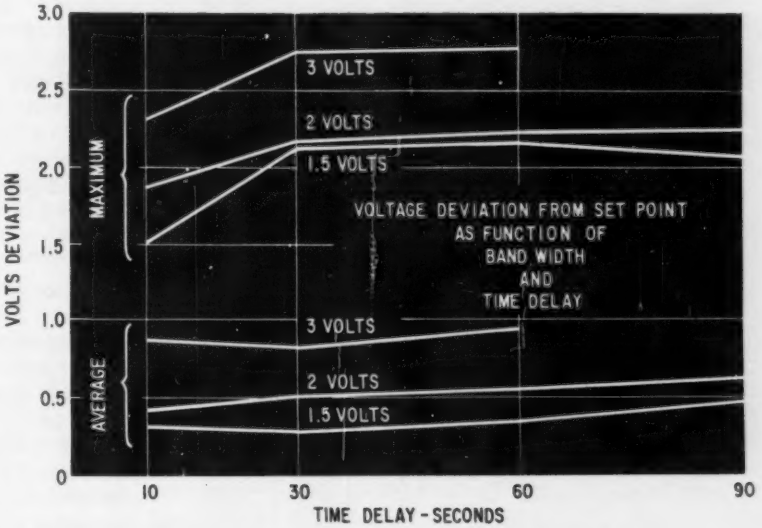


Fig 4—Voltage Regulator Performance on Distribution Feeders

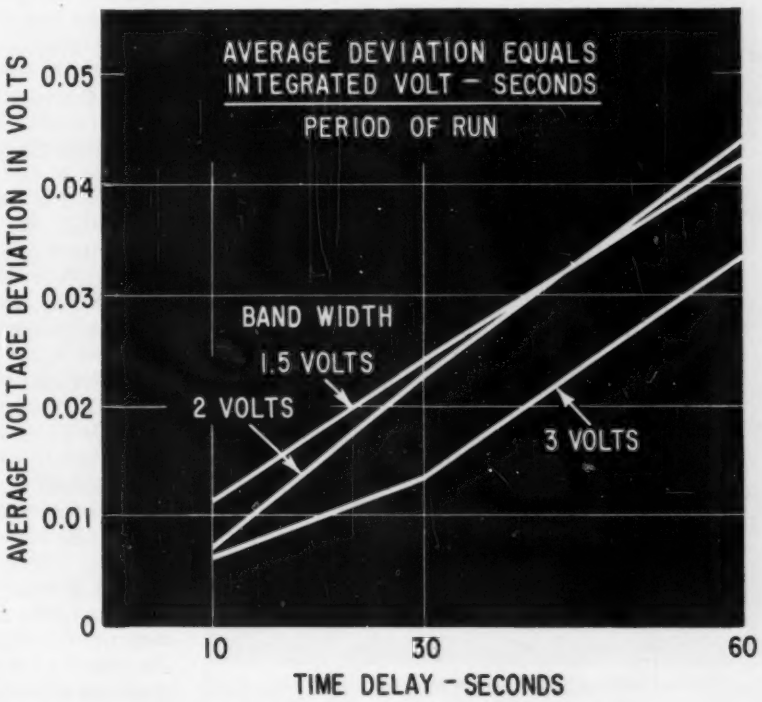


Fig 5—Regulator Performance Found by Analog Computer

Spacer Cable Benefits Justify

Comparison with open insulated wire shows Union Electric installations have better

R. G. STEINER, System Standards Engineer,
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Spacer cable frequently offers benefits enough to justify its higher installed cost in preference to open insulated wire, an economic comparison by Union Electric Co has established. Better voltage regulation and less tree trimming and right-of-way expenditures are the economic benefits. Still another advantage is the improved appearance of the spacer-cable construction.

Engineering of individual installations, however, remains a prerequisite for obtaining one or several of these advantages.

Admittedly, Union Electric's study was not entirely equitable. Based on the company's first four spacer-cable installations and its copper conductor in continued use, the study compares two metals whose market prices vary considerably at different times.

The spacer cable used is 477-MCM all-aluminum wire insulated with 85 mils of polyethylene and supported from a ⅜-in. Copperweld messenger. This was compared with No. 4/0 weatherproof copper, the Union Electric standard wherever covered conductor is required on the system. The company feels that the cost advantage of aluminum would have been offset to a large degree, were the salvage values of aluminum and copper included in the comparison.

Table I—Installed Cost of Spacer Cable vs Open Wire Compared

	Cost Ratio: Spacer Cable / Open Wire			
Item of Cost:	1st Job 2,900 Ft	2nd Job 4,300 Ft	3rd Job 1,550 Ft	4th Job 1,000 Ft
Material	1.81	1.74	1.02	1.01
Installation	2.30	1.40	1.61	1.42
Total Installed	1.97	1.63	1.16	1.10
Net Installed	2.18	1.80	1.33	1.28
Annual Charges	2.01	1.66	1.17	1.11

Table II—Compare Cost of Installed Conductor Plus Tree Trimming (Job No. 3)

Item of Cost:	Spacer Cable	Open Wire
Total Installed	$3,095	$2,675
Net Installed	3,055	2,295
Initial Tree Trimming	732	1,582
Net Installed Including Trimming	3,787	3,877
Annual Charges	506	558
Re-Trimming Prorated Annually	183	395
Total Annual Charges*	689	953

* Cost Ratio: Spacer Cable/Open Wire = 0.72

Table III—Compare Cost of Installed Conductor Plus Tree Trimming (Job No. 4)

Item of Cost:	Spacer Cable	Open Wire
Total Installed	$1,815	$1,649
Net Installed	1,793	1,401
Initial Tree Trimming	230	375
Net Installed Including Tree Trimming	2,023	1,776
Annual Charges	269	265
Re-Trimming Prorated Annually	58	94
Total Annual Charges*	327	359

* Cost Ratio: Spacer Cable/Open Wire = 0.91

Different Crews Used

Of the four spacer-cable installations, each was made by a different crew. Yet all crews were unanimous in their opinion that more experience with the spacer cable would have reduced installation time.

The four spacer-cable installations were built to operate at 4 kv. The first, made in the spring of 1958, consists of 2,900 circuit-ft of cable installed on an express portion of a new feeder from a city substation. The spacer-cable circuit was placed on the pole below an open-wire feeder. Both material and labor costs were considerably above those of equivalent open-wire construction. Annual charges against the investment for the spacer cable were about double those for open-wire when salvage values are considered.

The second installation, about 4,300 circuit-ft, made late in 1958, showed an improving cost ratio for spacer cable, compared with open wire. Although the material cost ratio improved only slightly over the first installation, the labor cost ratio was substantially better. The over-all ratio was 1.66. Here again, the cost ratio indicates that the spacer cable could not be justified on installed cost alone.

The third installation, made in January, 1959, was only 1,500 ft. There was a considerable reduction in the cost differential because of a substantial reduction in the price differential between conductors. The price of copper had risen 16% since the second job, while aluminum spacer-type cable had dropped 35%. As a result, the material cost was only 2% more than the materials for an equivalent installation of weatherproof copper wire.

Installation time for this third job was 1.61 times that of open wire, compared to 2.30 for the first and 1.40 for the second. For this short installation, set-up time was a major part of the overall time. Taking this into account, installation time compared favorable with that of the second job. When labor and material costs were combined, the cost ratio for the third job was only 1.17 for spacer cable, compared to 1.00 for open-wire construction.

On the fourth installation the cost pattern was simi-

Larger Outlay

voltage regulation and savings on trimming

lar to that on the third, 1.11 to 1.00. Material costs for the spacer cable were almost the same as for an open-wire job. Labor costs were about 40% more for the spacer-cable than for the open-wire construction.

Although spacer cable is still somewhat higher in cost, it offers compensating advantages. Chief of these are:

1. It reduces tree trimming, the cost of which varies widely from job to job depending on the type of trimming. Spacer cable is especially beneficial where it can be threaded through the center of a tree, only a small hole being cut. Where a tree must be topped, not much trimming is saved. All of the top must be removed in either event to save tree appearance.

2. The high strength of the messenger gives protection against falling limbs and ice load. Even when the cable breaks loose at the pole, there have been instances where it operated for even a week with the conductors on the ground.

3. The cable can be used on narrow easements where conventional open-wire construction would overhang.

4. The close spacing of conductors reduces reactance and provides better voltage regulation.

5. Elimination of crossarms improves the appearance of the installation. Anything that eliminates or compacts equipment affords an improvement in appearance.

Trimming Is Evaluated

If one or more of the advantages of spacer cable can be evaluated, the spacer cable may prove more economical. The cost of additional tree trimming, were open wire used in the third installation, would have been $940 initially and $212 annually thereafter. Spacer cable was used because permits could not be obtained for the trimming needed for open-wire construction.

Tree conditions were unusually difficult, and the spacer cable could be threaded through small holes cut through the trees. Appearance of the completed job is very good, the poles being set behind the tree trunks and the cable scarcely noticeable.

When trimming and re-trimming costs are included in the total costs, economy favors spacer cable for the third installation. The cost ratio reduces from the 1.17 to 0.72, a decided advantage.

A similar conclusion is reached when the extra tree trimming for open-wire construction is included for the fourth spacer cable installation. The resulting ratio changes from 1.11 in favor of open wire to 0.91 in favor of spacer cable.

In the first installation the installed cost ratio was 2.01 for spacer cable, compared to open-wire. But, when correction is made for the present reduced material cost of the spacer cable, the improved reactance and voltage drop obtained with the spacer cable brings its cost to slightly below that of the other construction.

SPACER CABLE in use is 477-MCM all-aluminum insulated with polyethylene, supported by Copperweld messenger

THREADING spacer cable through tree holes cuts trimming costs and gives installation improved appearance

CHARGE HOLES are made in flooded area by jetting rig, consisting of inner water jet pipe and outer pipe casing

SETTLEMENT STAKES measure surface subsidence in detonated area. They are installed before blast

Tower Foundations Compacted

Soils stabilized and compacted to permit use of spread footings, lowering tower costs

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Soil compaction through use of explosives was used to stabilize the loose, granular soils encountered at three tower locations of Project EHV. This was the first application of explosive soil compacting procedures to foundations for transmission towers. Sufficient compaction was obtained to permit use of spread footings, and at costs lower than if driven pile foundations were used. This method consists of detonating explosive charges buried below the ground surface. In loose, saturated, cohesionless soil, the shock and vibration of the explosion break down the natural structure, reducing the voids and forcing the free water out, forming a more dense structure.

The first three towers of Project EHV, the experimental extra-high-voltage transmission line project sponsored by General Electric, are located on the flood plain adjacent to the Housatonic River south of Pittsfield, Mass. They have total heights of 77 to 128 ft and are approximately 140 ft across at the base. Dead weight of these structures is over 130 tons and, when loaded by conductors, vertical force transmitted to a compression footing at base of a leg is over 250 tons (EW, Jan. 11, 1960, p 50).

Borings Show Loose Soil

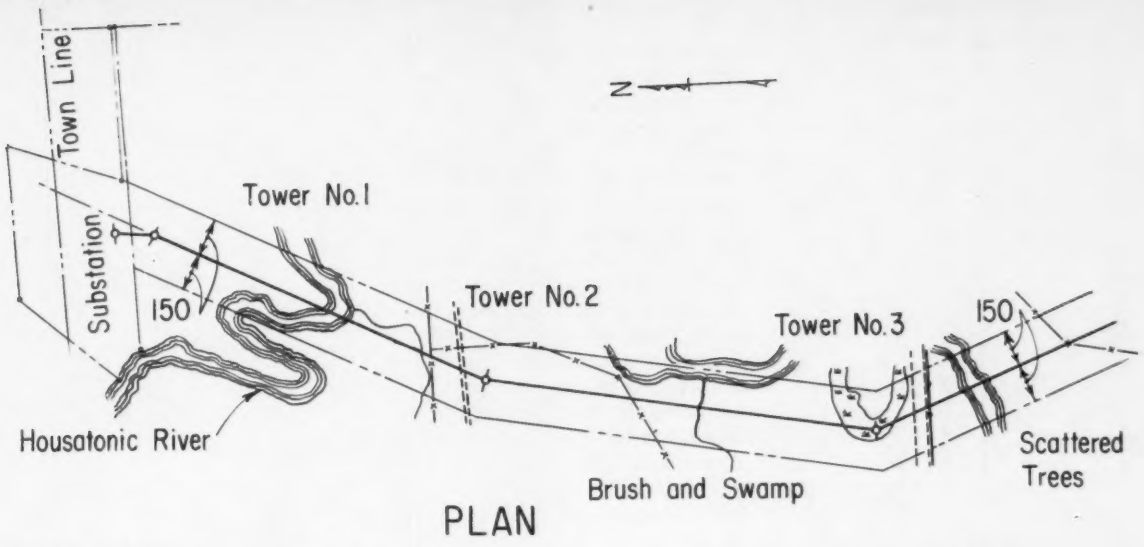
In evaluating foundation conditions, soil borings were taken 90 ft either side of the center line of each tower. These borings showed the soil to over 100 ft depth to be a loose, uniform, fine to very fine micaceous sand. The material is water-laid and contains varying amounts of silt with no marked degree of horizontal stratification. A typical boring and the range of gradation of the material are shown.

Studies of various types of foundations for the structures resulted in two choices: driven piles or spread footings. Since the water level was close to the surface and there was no sufficiently dense founding stratum within reach, deep excavations or drilled-in piles were not practicable.

Due to soil conditions, driven piles would have been of the friction type, depending on the frictional force along their surface for their supporting power. To take advantage of any densification of the soil which might occur during driving, displacement piles such as wood, concrete or steel pipe would have been used. Because the soil was so loose, long piles would have been required to develop sufficient frictional resistance, resulting in high costs for the foundations.

The use of spread footings on the soil in its natural state was not practicable. Low bearing values would have been required, and differential settlement across the foundations might still have occurred under load. Also, saturated loose, granular soil might compact or even liquefy if subjected to vibration or a sudden heavy shock.

Cohesionless soils, however, can be compacted and, once densified,



PLAN

PLAN shows 0.65-mile section of the 4.3-mile experimental transmission line including the three portal towers located on the flood plain adjacent to the Housatonic River, slightly south of Pittsfield, Massachusetts

With Explosives

remain unless redisturbed. Most methods of in-place soil compaction require special, heavy equipment and are not economical for small, widely-spaced sites such as tower foundations because of the costs of moving.

Compaction of soils with explosives was developed and used by the US Army Corps of Engineers at the Franklin Falls Dam in Franklin, New Hampshire, for compacting the terraces at the sides of the river. It was later used for dam sites in Texas and New York.

Results Measured

The effectiveness of explosive compaction at a site is determined experimentally. Some measure of its suitability can be found from an examination of the materials and a determination of their physical characteristics; but, since it is almost impossible to obtain an undisturbed sample of cohesionless soil, a proper evaluation of the structure of the materials is difficult to make. Accordingly, in evaluating the suitability of explosive compaction for this site, a series of single charge tests were carried out near Tower 1, using different depths of placing the charge and various weights of explosives.

According to the literature, the sphere of influence of an underground explosion may be approximated by:

$W = c R^3$

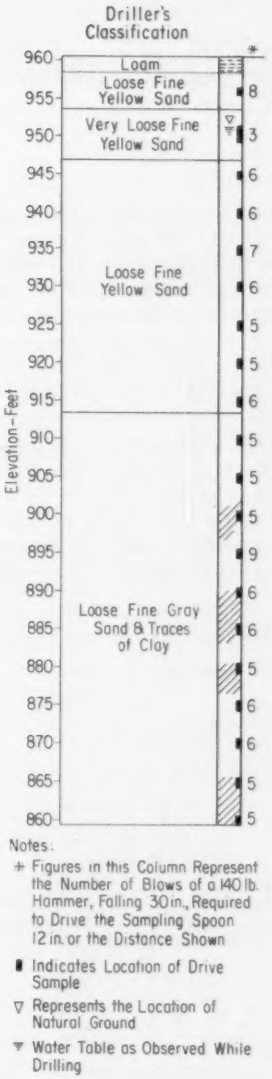
where W = weight of dynamite charge in lb

c = coefficient, which is 0.0025 for 60% dynamite

R = radius of sphere of influence in ft

Using this method, weights of explosives were determined which would have radii of influence of 12, 14 and 16 ft. These distances were chosen so that the charge could be placed near the center of the layer to be compacted. A minimum thickness of this layer of 20 ft below founding grade was considered necessary to spread foundation loads sufficiently to keep the loading on the material within acceptable limits both as to settlements and shock effects. Minimum founding grade had been established as 4 ft below ground surface to eliminate frost action.

Four, six and eight-pound charges of 60% strength straight dynamite were placed 12, 14 and 16 ft under-



Notes:

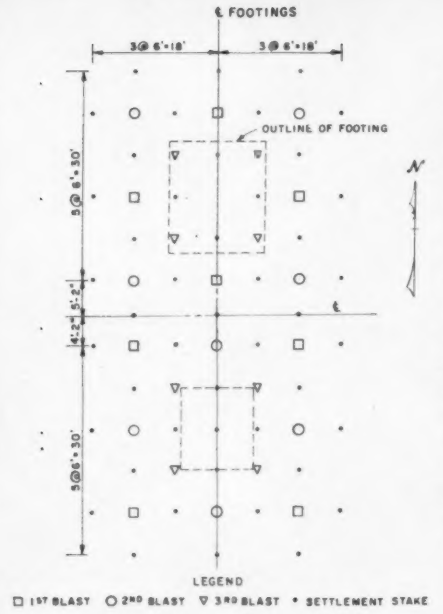
* Figures in this Column Represent the Number of Blows of a 140 lb. Hammer, Falling 30 in., Required to Drive the Sampling Spoon 12 in. or the Distance Shown

▮ Indicates Location of Drive Sample

▽ Represents the Location of Natural Ground

▼ Water Table as Observed While Drilling

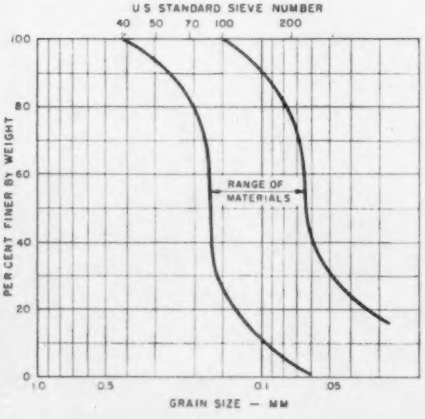
UNIFORM, FINE, LOOSE SAND shown by soil borings over 100 ft deep



FOUR SEPARATE BLASTS are detonated; 3 of 8 charges and 1 of 24 charges

ground for these tests. Stakes were driven into the ground 6 and 12 ft away from the charge and encircling it, so that settlement of the ground surface could be measured. In addition, a test pit was dug adjacent to the test area prior to any blasting, and natural in-place densities determined at various depths. These average 82 lb per cu ft, dry density.

The tests showed that the soils could be compacted with explosives and that a 4-lb charge placed 12 ft underground gave the maximum compaction without cratering. It



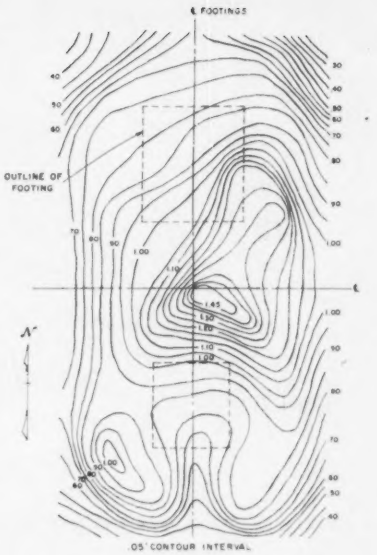
UNIFORM SIZE of sand found by soil borings made at foundation sites

was also found that thorough wetting of the material was necessary to eliminate capillary forces between soil grains. Where wetting did not occur naturally, dikes were constructed around the edge of the area to be compacted. It was then flooded, creating a pond, which was maintained throughout the operation. Topsoil, which was removed from the sites to permit rapid percolation of the water, was used for the dikes. A second test pit was excavated at the location of the optimum charge following the tests so that in-place densities after compaction could be determined. These averaged 90 lb per cu ft, dry density. No cavity was found at the location of the charge.

Procedure Described

Using the optimum weight of charge and depth of placing as determined from the single shot tests, an area test was run on the site of the west leg of Tower 1. The topsoil was removed and used for dikes which formed a pond over the area to be tested. Four separate blasts were made over the area, 3 consisting of eight 4-lb charges each, detonated simultaneously, and the fourth of 24 ½-lb charges at the locations of all charges of the three previous blasts but at a depth of 6 ft, and detonated simultaneously. A typical layout of charges is shown. Settlement stakes were placed at all intermediate points to measure the surface subsidence. The elevations of these stakes were measured before each blast, as soon after it as possible, and again 2 hr later to measure any time effects.

The area was kept flooded for over 48 hr prior to the first blast to ensure saturation of the soil. A jetting rig for making the charge holes consisted of an inner water jet pipe which made the hole and an outer pipe casing which followed it down and held the hole open while the charge was placed. After the casing was jetted down and washed clean, the jet pipe was removed. The charge was then lowered into the casing and pushed down into the soil below the bottom of the casing with a long wooden tamper. The casing was then withdrawn, after removing the tamper, and the hole filled with clean sand tamped in place so that it would not provide a ready path of escape for the gases



DISHING OF AREA results from blasts; contour map shows final settlement

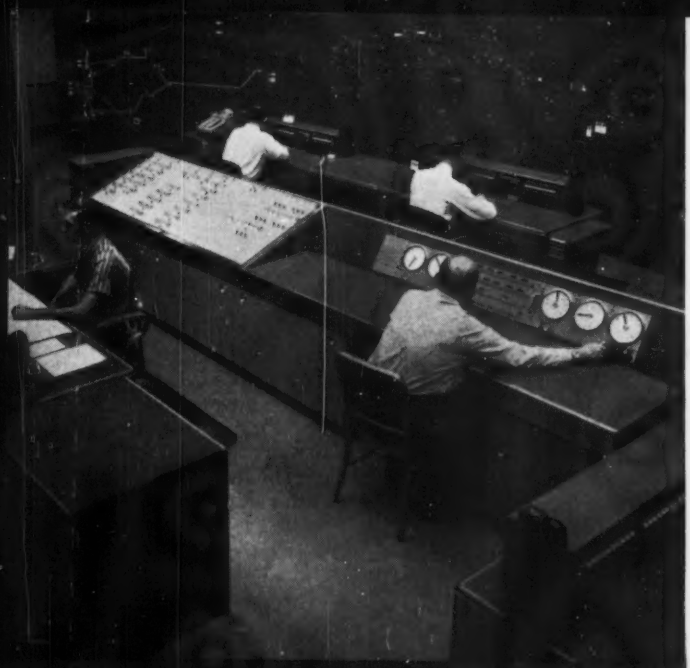
of the explosion. Using this method, the area could be kept flooded continuously and, in later work, it was possible to make two blasts per day, one at each leg of a tower. In no case was any area shot more than once a day so that the maximum effect of each shot could be obtained.

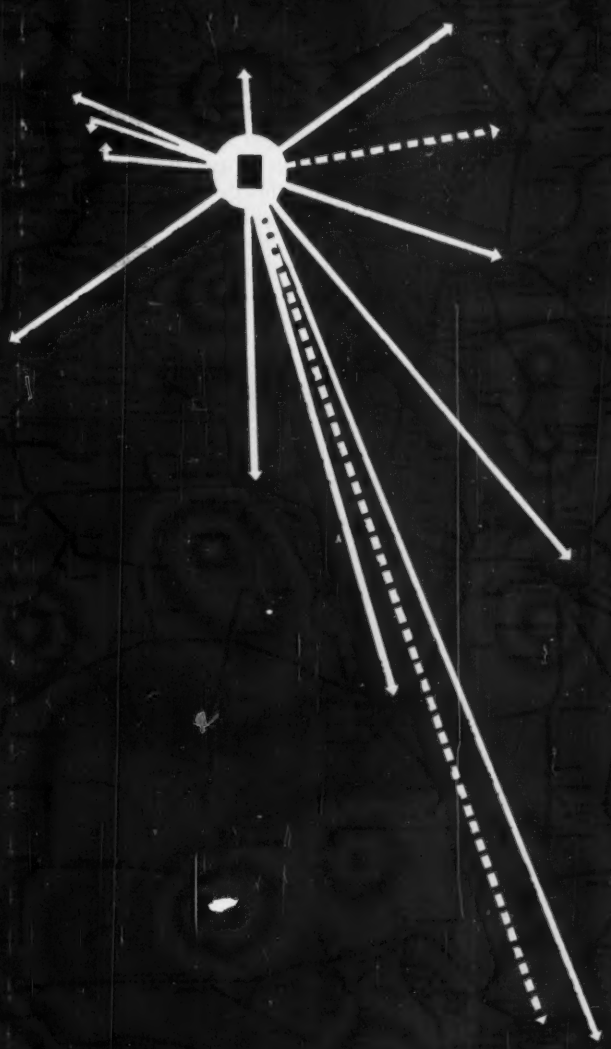
Soils Settle

When a blast was detonated, there was a general uplifting of the surface of the area and, as the gases of explosion pushed upward, small geysers developed at the shot holes and at other scattered points, spurting gas, water and fine materials into the air. As these were forced out, the liquefied soil settled, acquiring a new intergranular structure and becoming more stable and dense than it was before. Successive blasts caused further densification up to a point, beyond which the effectiveness of additional shots diminished. This provided another indication that the material was becoming more stable and less subject to shock effects.

A general dishing of the surfaces of the area resulted from each blast. To illustrate this subsidence, settlement contours ars shown for a compacted area. This is illustrated showing the final settlements of the area with a maximum of approxi-

(*Continued on page* 66)





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Polyphase Kwhr-Meter Test Hazard Eliminated

M. E. CULBERTSON, Division Meter Superintendent,
W. E. DUNFEE, Engineer-Meter, Ohio Power Co, Steubenville, Ohio—AEP System

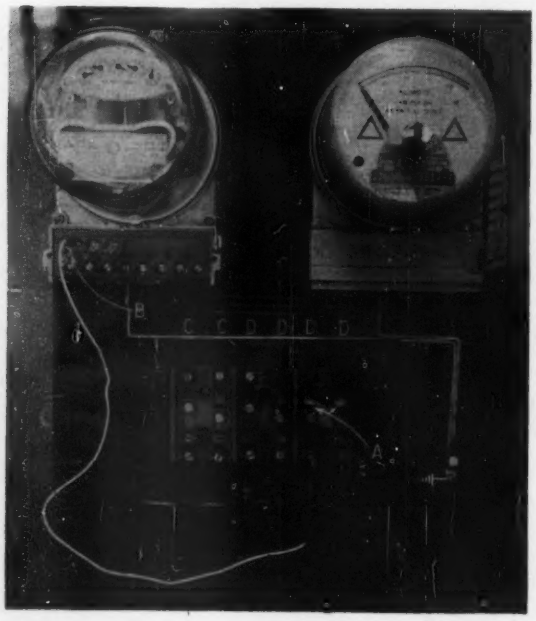
A new procedure has been developed at Ohio Power Co to eliminate potential hazards in testing polyphase kwhr meters. In addition to the safety gains achieved, the new method cuts testing time somewhat by reducing the number of times the test links need to be opened and closed and by eliminating the opening and closing of the potential test links in the demand meter.

Formerly, the various methods used had employed energized current circuits. Because connections could accidentally be made to the wrong phase, or to ground, the energized current circuit presented a potential hazard, which in some cases had resulted in personal injuries and damage to equipment. In the old method, a potential difference of 240 v existed across the $\frac{3}{16}$-in. openings at points "A" and "B," 208-v difference between points "C" and ground, and 120-v difference between points "D" and ground.

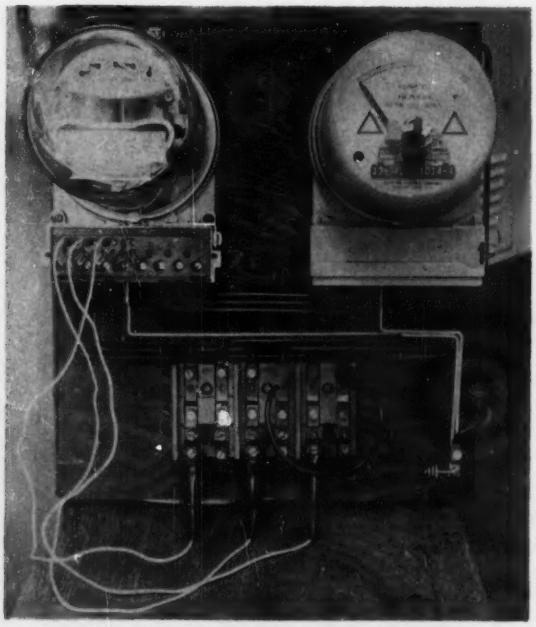
The improved method isolates the meter current circuits from the power during the test. First, the meter is by-passed by shorting across the appropriate contacts on the connection block. Then, the upper half of the connection block is isolated from the lower half by removing any test links jumpering connections between the two. This isolates the upper contacts from any source of voltage and makes the meter contacts "dead." Potential test links connecting current and potential coils at the meter can then be opened to isolate the current circuit, without any danger from voltage.

In testing the meter, the test leads are first connected to the various potential coils at the potential test links on the meter. The other end of each test lead is then clipped onto its respective phase, on the line side of the connection block. As the meter is tested, the current coils of the meter and the current circuit of phantom load and rotating standard remain isolated from the power source and line voltage.

The above connection plan can be used when testing any polyphase self-contained kilowatt-hour meter. While this particular installation shows connections for testing the bottom element of the delta kwhr meter, the same principle is also used to test the top element.



Old arrangement for testing self-contained kwhr meter



New arrangement for testing the same type of kwhr meter

Determine Motor Starting Effects

R. A. DEWBERRY, Electrical Engineer, Montana-Dakota Utilities Co, Minneapolis, Minn.

Although numerous factors are involved in making motor starting calculations and determining the effect motor starting has on a distribution system, voltage is actually dependent on only two components: circuit impedance and magnitude of starting current. This analysis determines these components for 3-phase motors in the range of 208/240 v. The method is applicable to motors of other voltages, but the data presented are for 208/240-v motors only.

Because voltage fluctuations caused by motor starting affect all customers supplied by a circuit, conditions at the worst location on the system are controlling. This location is on the secondary side of the transformers supplying the motor. Therefore, it is necessary to determine the impedance of the substation, primary line, distribution transformer supplying the motor, and connected secondaries. In Fig 3, 4, and 5 these impedances are designated, respectively, as Z_s, Z_p, Z_t, and Z_l.

Total circuit impedance is then $Z = Z_s + Z_p + Z_t + Z_l$. Z_t and Z_l may be omitted if the distribution transformers do not supply any lighting load. Maximum permissible voltage drop is dependent on maximum allowable lamp flicker, and if no lights are supplied, these impedances need not be included.

To arrive at total circuit impedance, it is necessary first to get all impedances on a common voltage base. A base of 240 v was chosen because of the voltage range of the motors. All impedances are figured at 30% power factor.

Substation. All substation transformers, regardless of make, have nearly equal impedances for any one size. Regardless of voltage rating, the ohmic value, when referred to a common voltage base, is, in effect, dependent only on kva rating.

Ohmic values, referred to 240 v, are given in Fig 3 for various substation sizes. As most substations have regulators, the substation impedances include a component of impedance for regulators.

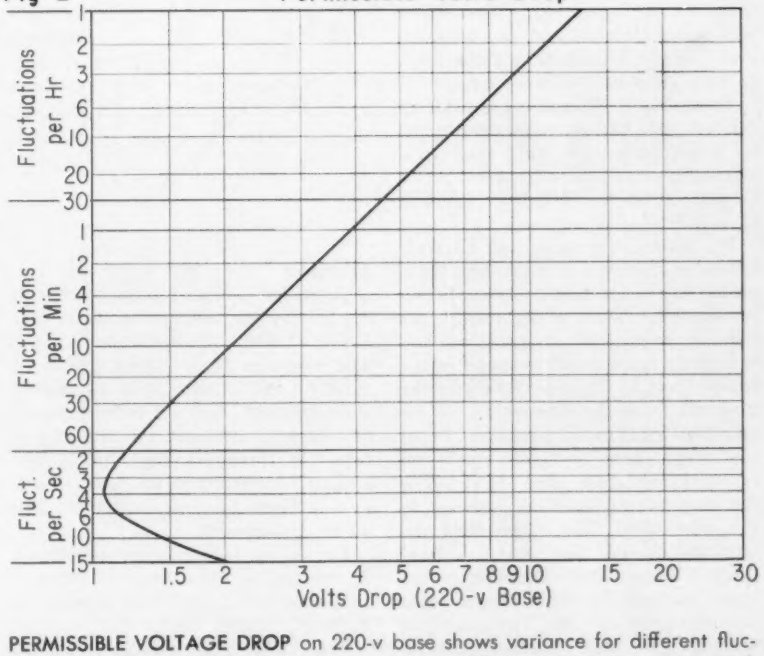
Primary Lines. Fig 5 gives the ohmic value of impedance for various wire sizes and spacing referred to 240 v. As impedance varies as the square of the voltage ratios, the actual value at 240 v is multiplied by $\left(\frac{240}{\text{primary voltage}}\right)^2$ to get the ohmic value for various primary voltages.

Transformer Impedances. The impedance of the distribution transformer is determined in the same manner as that for the substation except that the kva of one unit is used instead of total bank kva. For unequal transformer sizes, the kva of the lighting unit is used. Primary

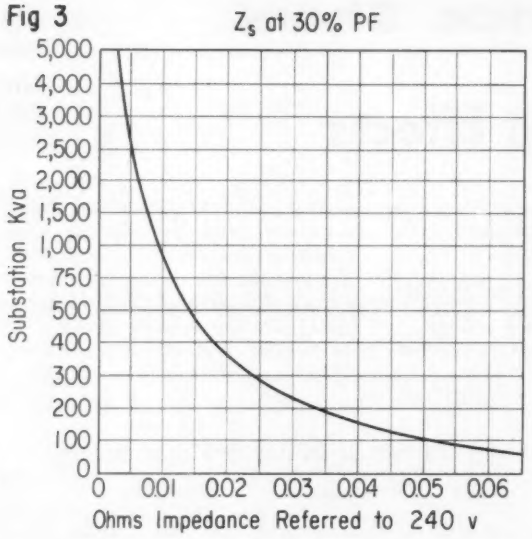
Fig 1 **Starting Current of 220-v 3-Phase Motors**

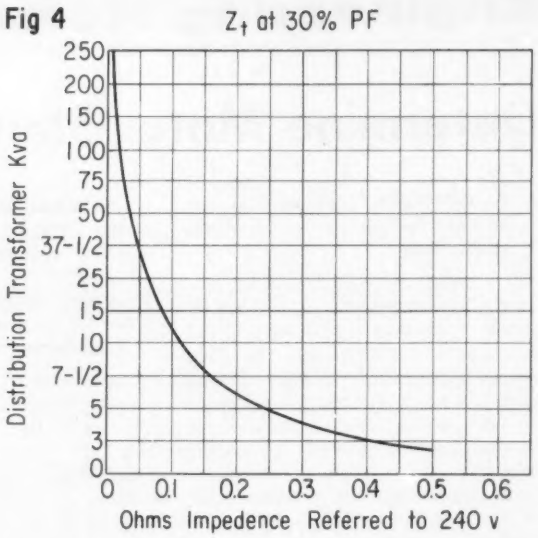
NEMA Classification	Horsepower									
	10	20	30	40	50	60	70	80	90	100
A	79	157	236	314	393	472	550	630	710	790
B	85	170	257	341	427	513	600	680	770	850
C	98	197	297	394	490	590	686	787	887	980
D	111	223	336	444	560	670	780	890	1000	1100
E	125	250	375	500	625	748	870	1000	1130	1250
F	138	275	416	550	690	825	966	1100	1250	1380
G	156	312	470	625	780	940	1090	1250	1410	1560
H	176	352	535	705	882	1060	1230	1410	1590	1760
J	197	396	596	793	994	1190	1390	1590	1790	1980
K	236	472	708	945	1180	1420	1650	1890	2120	2360
L	249	500	745	1000	1250	1500	1720	2000	2240	2500
M	278	556	834	1110	1390	1670	1950	2230	2500	2780
N	310	620	930	1245	1550	1870	2180	2490	2520	3100
P	349	695	1040	1390	1740	2080	2430	2780	3120	3490
R	394	789	1180	1575	1970	2370	2740	3150	3540	3940
S	445	890	1340	1785	2230	2680	3120	3570	4040	4460
T	500	1000	1500	2000	2500	3000	3500	4000	4500	5000
U	556	1110	1670	2220	2780	3330	3910	4450	5050	5560
V	656	1310	1970	2620	3270	3940	4600	5240	5900	6550

Fig 2 **Permissible Volts Drop**



PERMISSIBLE VOLTAGE DROP on 220-v base shows variance for different fluctuation rates. Figure was adapted from General Electric Distribution Data Book





OHMIC VALUES for different components are determined easily. Fig 3, upper left, shows substation transformers; Fig 4, upper right, impedance of the distribution transformer; Fig 5, below, primary line and secondaries

voltage rating has no effect on ohmic value as the latter is determined on a 240-v base.

Secondary Impedance. The secondary impedance is given in Fig 5.

All 3-phase motors are marked with NEMA code letters to specify locked rotor kva per hp. Taking values midway in the NEMA ranges and applying them to 220-v motors, average starting current corresponding to the code letter is found.

Fig 2 shows permissible voltage drop on a 220-v base for various frequencies of fluctuation. This figure was adopted from one in the General Electric Distribution Data Book to volts drop on a 220-v base.

From Fig 1, the numerical value of NEMA code letters can be determined by letting hpA, hpB, hpC, etc., equal starting current and solving for A, B, C, etc. Then A =7.9, B = 8.5, and C = 9.8.

By finding the values of all code letters in this way and plotting them on log-log scale against motor horsepower, the product of the two-factors —horsepower and code letter value— is starting current and is found in the Motor Starting Chart by following the diagonal from the intersection of hp and code letter to the base line. From this point, drop vertically to Z, on reversed log scale, and then follow the diagonal to the right back up to the base line. The point thus determined is IZ, the actual voltage drop. Then drop vertically in the lower part of the chart to the point corresponding to the frequency of starting and read whether reduced starting voltage is required.

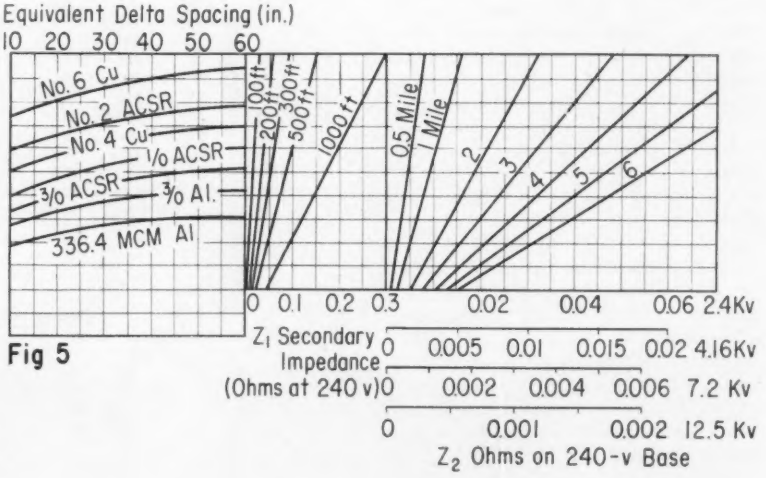


Fig 5

Example:

A 20-hp, 220-v, 3-phase motor is started on the average of twice per hour. NEMA classification is "E." The motor is on a 2.4-kv circuit of three 1/0 ACSR with 30 in. equivalent delta spacing. It is 1.5 miles between motor and substation, the latter composed of three 100-kva units. Distribution transformers are three 10-kva units. There are 100 ft of three 1/0 ACSR secondaries.

From Fig 3, substation impedance Z_s, referred to 240 v, is 0.023 ohms.

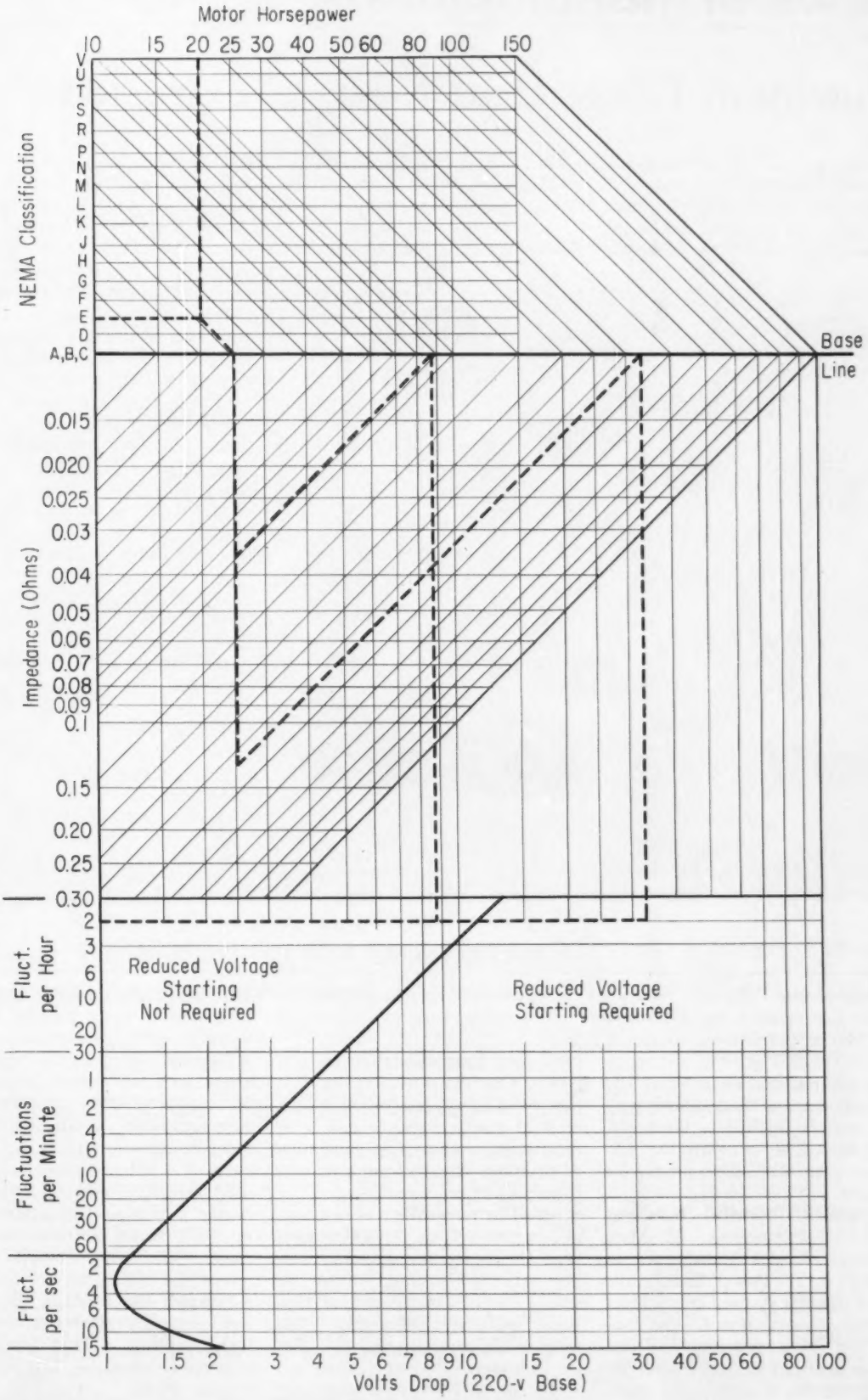
From Fig 4, transformer impedance Z_t is 0.12 ohms.

From Fig 5, secondary impedance Z_1 is 0.02 ohms, and primary impedance Z_2 is 0.0135 ohms.

$Z = 0.023 + 0.12 + 0.02 + 0.0135 = 0.1765$ ohms. Enter chart in upper left at hp = 20 and NEMA classification "E." At their intersection, follow the dotted line to the base line and drop vertically to Z = 0.1765. Then follow diagonal to the right, up to the base line, and drop vertically to two starts per hour. Terminal point is in area where reduced voltage starting is required.

If there is no lighting supplied by the transformers, $Z = 0.023 + 0.0135 = 0.0365$ ohms and, following the same procedure, a terminal point is reached where reduced voltage starting is not required.

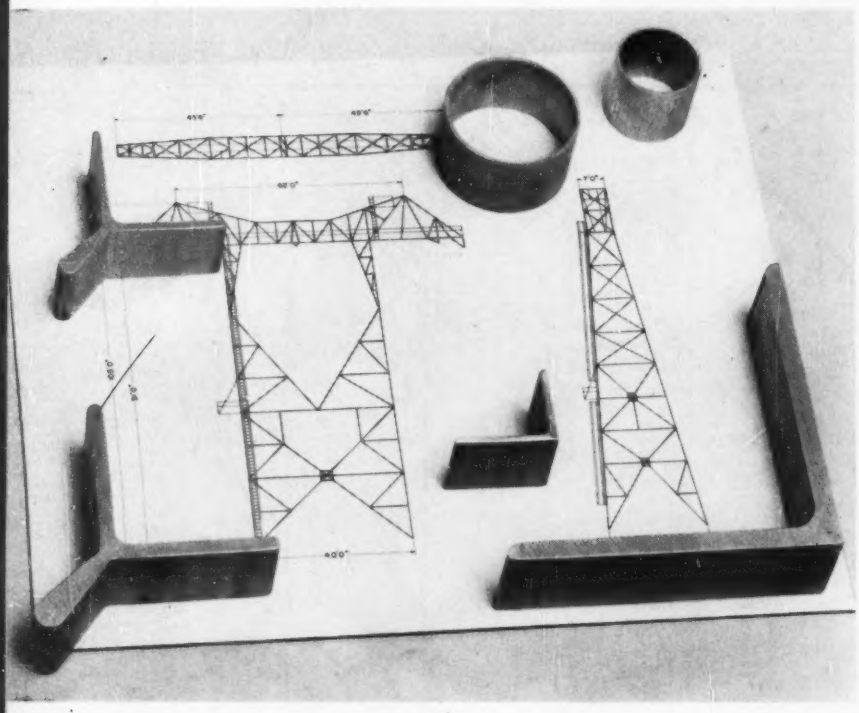
Motor Starting Chart for 220-v 3-ϕ Motors


Motor Horsepower
10 15 20 25 30 40 50 60 80 100 150
NEMA Classification
V U T S R P N M L K J H G F E D
A,B,C
Base Line
Impedance (Ohms)
0.015 0.020 0.025 0.03 0.04 0.05 0.06 0.07 0.08 0.09 0.1 0.15 0.20 0.25 0.30
Fluct. per Hour
2 3 6 10 20 30
Reduced Voltage Starting Not Required
Reduced Voltage Starting Required
Fluctuations per Minute
1 2 4 6 10 20 30 60
Fluct. per sec
2 4 6 10 15
1 1.5 2 3 4 5 6 7 8 9 10 15 20 30 40 50 60 80 100
Volts Drop (220-v Base)

Aluminum Tower Uses New 'Y' Extrusion

Aluminum Co of America has designed and built a 105-ft-high transmission tower which utilizes three types of extruded aluminum structural shapes and "represents an optimum design for aluminum." The all-aluminum tower is installed at General Electric Co's Project EHV.

Alcoa says that, in addition to tubular sections used for compression members of the web system and angles used for tension members, there is a unique, specially designed "Y" shape for legs and crossarms (see photo left). All the extrusions come in various sizes and are now commercially available.



In designing the tower, the company says its goal was minimum installed cost for a free-standing or conventional tower design. "A less expensive tower of exotic design might be devised," the company points out, "but US utilities generally do not wish such a tower. This tower could have been made somewhat lighter, but at an increase in cost. We think we have a true optimum to meet the utility industry's needs."

Total weight of the tower is 15,000 lb, but without catwalks and ladders needed for the experimental project, the weight would be only 11,400 lb, the company says. All of the bolted tower's structural members were extruded from 6061-T6 aluminum alloy at the company's Cressona, Pa., works.

Also installed at Project EHV is a guyed aluminum "V"-type tower built by Aluminum Ltd of Canada (EW, May 23, 1960, p 96).

MANUFACTURERS BRIEFS

• **Westinghouse Electric Corp's** capital expenditures for 1961 will total $60 to $65 million, compared with $60 million in 1960, with none being spent abroad either year. The company says a "substantial portion" will be applied to the utility equipment field, but only the new Muncie plant will add to productive capacity.

• **Associated Electrical Industries Ltd** has shipped a 225-Mva, 3-phase generator transformer to Willington "B" Power Station, the largest ordered by the Central Electricity Generating Board. The 256-ton unit steps generator no-load voltage up from 16.5 to 295 kv for supply to the supergrid. A high-speed, on-load tap changer provides ±10% voltage variation in 18 equal steps.

• **Atomics International,** division of North American Aviation, Inc, has formed an energy conversion department to conduct work in new technical areas, emphasizing generation of electricity directly from heat, e.g., from nuclear reactors.

• **Allis-Chalmers Mfg Co** has supplied a dual-voltage, 3,500-kw regulated silicon rectifier dc power supply for the existing 600-kv dc silicon rectifier installation at Oak Ridge National Laboratory. The rectifier has a dual rating of 3,500 kw at either 1,000 or 500 v, and 3,500 amp at 1,000 v or 7,000 amp at 500 v dc—accomplished by means of a series parallel reconnection arrangement on dc output.

• **General Electric Co** has announced it will spend more than $1 million in 1961 to enlarge its communication products department headquarters plant in Lynchburg, Va. Major portion will be used to increase manufacturing productive capacity. The facility, built in 1957, houses the firm's two-way radio, microwave-multiplex and power line carrier current lines.

• **Edwards Co, Inc,** has adopted a new corporate symbol and signature, featuring a bold letter "E" centered within an inverted triangular shield.

Your Hole-Boring Equipment Lets You Install Chance Screw Anchors Almost Anywhere in 5 to 8 Man-Minutes

Your present boring equipment, regardless of type, can be adapted to power anchor installation simply by using a special Chance wrench that transmits torque from the digger directly to the hub of the anchor helix. Then, your crews are set to install anchors in 5 to 8 man-minutes . . . *from the time the equipment is moved into position until the anchor is ready for the guy.* (By adding a screw anchor adapter, the installation wrench can be attached without removing the auger bit.)

Chance Power Installed Screw Anchors go down fast, uniformly . . . anywhere that you can bore a pole hole with your power hole-digging equipment. Slow, tedious labor is eliminated. So, too, is error caused by human variables. Line construction is speeded, and you realize more on your investment in hole-boring equipment. Since the anchor rod itself is not subjected to torque, it only has to be heavy enough to support the guy load. That's a cost-saving factor, too.

Chance Screw Anchors range in size from 78 to 176 square inches in area. Their sharp cutting helixes of high-strength structural steel are tapered to minimize earth disturbance. Hundreds of installation and pull tests prove that Chance Power Installed Screw Anchors hold with less creep than any other anchors of comparable size. So, isn't it time for you to consider the advantages of mechanization of screw anchor installations?

Use Chance Power Installed Screw Anchors and get:

- Lower installation costs per anchor
- Better utilization of expensive equipment
- Greater holding power with less creep
- Consistent results
- Elimination of human variables
- Less physical effort, better employee relations

Contact your Chance Representative. He'll show you how you can apply this new anchoring technique to save time, cut costs, and improve your anchoring.

A. B. CHANCE COMPANY

CENTRALIA, MISSOURI (A. B. Chance Company of Canada, Ltd., Toronto)

CA60-31

STEEL STRAND

Mandrel Test*

Checked and Double-Checked by Laboratory Technicians

Every coil of wire used in the manufacture of *Crapo* Galvanized Steel Strand is tested and approved by trained laboratory technicians. Samples from both ends of each individual coil are subjected to a series of prescribed tests before stranding. Then, the finished strand is re-checked to make certain that it conforms in every respect to established specifications and our own high quality standards.

Thus you know when you specify *Crapo* Galvanized Strand that every precaution has been taken to assure maximum performance in the finished product.

Write for Free Booklet

"The Story Behind Crapo Galvanized Wire and Strand" illustrating and describing manufacturing techniques and testing procedures. Ask for Booklet B-59!

AVAILABLE IN 3 COATING WEIGHTS

FOR GUYS, MESSENGER AND OVERHEAD-GROUND WIRE

Crapo Steel Strand is available in all standard sizes and grades and in Class A, B and C galvanized coatings. Class B coating is twice as heavy as Class A coating; Class C coating is three times as heavy.

*Determines ductility of wire and adherent quality of galvanizing.

INDIANA STEEL & WIRE CO., INC.
Muncie, Indiana

Manitoba Power Industry Has 7% Annual Growth

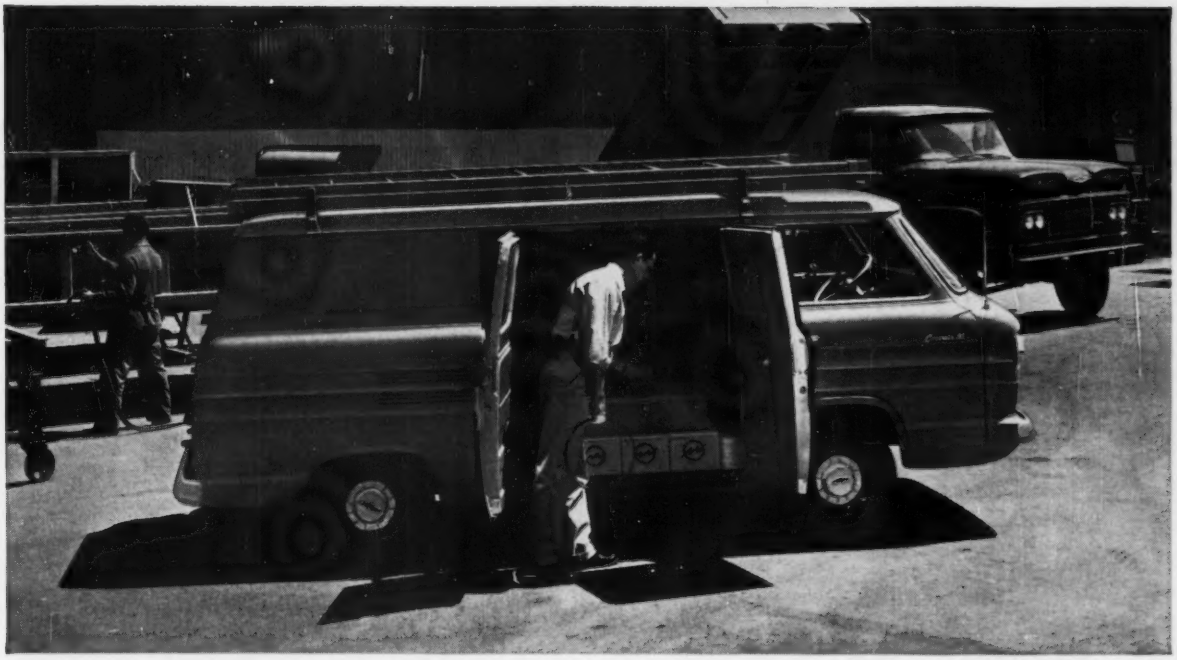
Manitoba's electric power industry is growing at an annual rate of 7%. L. A. Bateman of the Manitoba Hydro-Electric Board pointed to this growth rate as he outlined the power development program of the Central Canadian province. He said that the five 32.5-Mw units now being installed to supply the International Nickel Co development at Thompson will bring Manitoba's installed capacity to more than 1 million kw.

Speaking before the 1960 Area Power Conference at Grand Forks, N. D., Bateman elaborated on his own company's future plans. The Hydro-Electric Board's projects on the upper Nelson river, he said, will add about 450 Mw of high load factor energy. The company's Grand Rapids project, scheduled for initiation in 1964, will use four Kaplan (variable pitch) propeller turbines to provide a capacity of 440 Mw at a 38% load factor. Other hydro resources will be developed as demand arises.

British Test Concrete Containing Fly Ash

Destructive tests to determine the strength of concrete made with fly ash from power stations are now underway in Britain. The Newman Spinney experimental station, constructed largely of this material, is being scientifically wrecked after operating for only six months. The station, located in Derbyshire, was built specifically for this fate by the Central Electricity Generating Board. While still in operation, it was used for studies on running a power station on gas produced by burning underground coal seams.

Before beginning the tests, boilers and generating equipment, which supplied much of the fly ash used in the station's construction, were removed. Then engineers set hydraulic jacks, capable of exerting many tons of pressure, against the main beams in the generator house. The jacks apply force to each beam until it reaches the breaking point. Then they are moved methodically to the next beam.



Corvan features 1,800-lb. load capacity!

CHEVY'S CORVAIR 95 TRUCKS

DRIVER'S UP FRONT... ENGINE'S IN THE REAR AND ALL THE REST IS WORK SPACE!

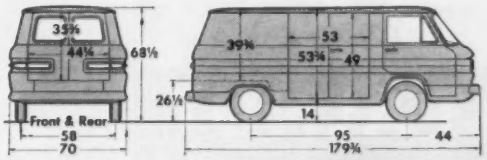
■ Open a Corvan's wide double doors and see how easily that load compartment can be adapted to your type of utility operation. There's ideal work space for installation, repair or cable splicing equipment. Enough capacity to hold 1,800 lbs. of tools and materials in an area that's 120″ long, 58.6″ wide and 53.7″ high at the center! That's more space than you get in a half-ton panel, and it's more accessible, too. Opens from the right side *and* the rear, with additional left-side doors available at extra cost.

■ Open the engine compartment in the rear and you'll see where this one does its saving. That thrifty air-cooled power plant never uses water or antifreeze; never requires new hose connections or radiator repairs. You can count on quick warmup, too.

■ Could be one of the Corvair 95 pickups would work even better on your operation. Like the Corvan, they have 4-wheel independent suspension, one-piece body-frame construction and a highly maneuverable 95-inch wheelbase. Talk to your dealer—choose the model that fits your specific fleet needs. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

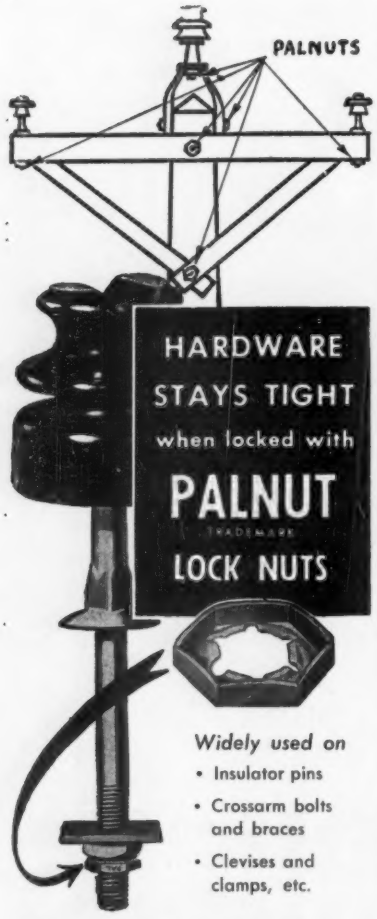
SPECIFICATIONS

AXLE, REAR: ratio 3.89. **BRAKES:** hydraulic, front and rear 11″ x 2″; lining area 167 sq. in. **CLUTCH:** 9⅛″ dia. **DIRECTIONAL SIGNALS:** front and rear. **ENGINE:** Turbo-Air Six; 80 hp; 145-cu.-in. displacement. **FUEL TANK:** capacity 18½ gallons. **GVW:** 4,600-lb. maximum. **SPRINGS:** coil, front and rear, each with 1,150-lb. capacity. **STEERING:** ball-gear, ratio 20:1. **SUSPENSION:** independent front and rear, each with 2,500-lb. capacity. **TIRES:** five tubeless 7.00-14/4PR. **TRANSMISSION:** 3-speed synchro-mesh. **WINDSHIELD WIPERS:** dual electric; single speed. **EXTRA-COST OPTIONS** include Powerglide or 4-speed synchro-mesh transmission; a choice of 14 two-tone color combinations; plus dealer installed comfort and convenience features.



A NATURAL FOR FLEET DUTY!

CHEVROLET



Widely used on

- Insulator pins
- Crossarm bolts and braces
- Clevises and clamps, etc.

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- **Eliminate radio interference due to loose hardware**

Every bolt - and - nut assembly locked with PALNUT Lock Nuts stays tight, despite weather, wind, stress and vibration. PALNUTS, tightened on top of the regular nuts, prevent loosening and falling off. Very low in cost—easily, speedily applied — require little space — may be used on new or existing assemblies. Hot dip galvanized, silicon bronze and other materials and finishes. Stocked by all leading pole line hardware manufacturers.

The PALNUT Co.
DIVISION OF UNITED-CARR FASTENER CORP.
51 Glen Road
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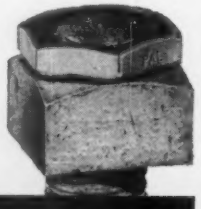


PALNUT
TRADE MARK
LOCK NUTS
for quick, secure fastening at low cost

Distribution Is Co-op Topic

Higher-voltage distribution primaries and better sectionalizing were discussed before 54 representatives of TVA power distributors at the Eastern Division Power Distributors Assn meeting recently in Chattanooga, Tenn. Fred G. Terry (right in photo) was meeting chairman.

W. M. Wilson, Nashville consulting engineer, (center in photo) described plans and economic studies for gradual conversion of two cooperative systems from 7.2/12.45 to 14.4/24.9 kv. The systems were those of Middle Tennessee Electric Membership Corp and Caney Fork Electric Cooperative. System portions ready for cutover will have their voltage stepped up by autotransformers before the substation is converted. Subsequently the autotransformers will step down voltage on portions yet to be cut over.

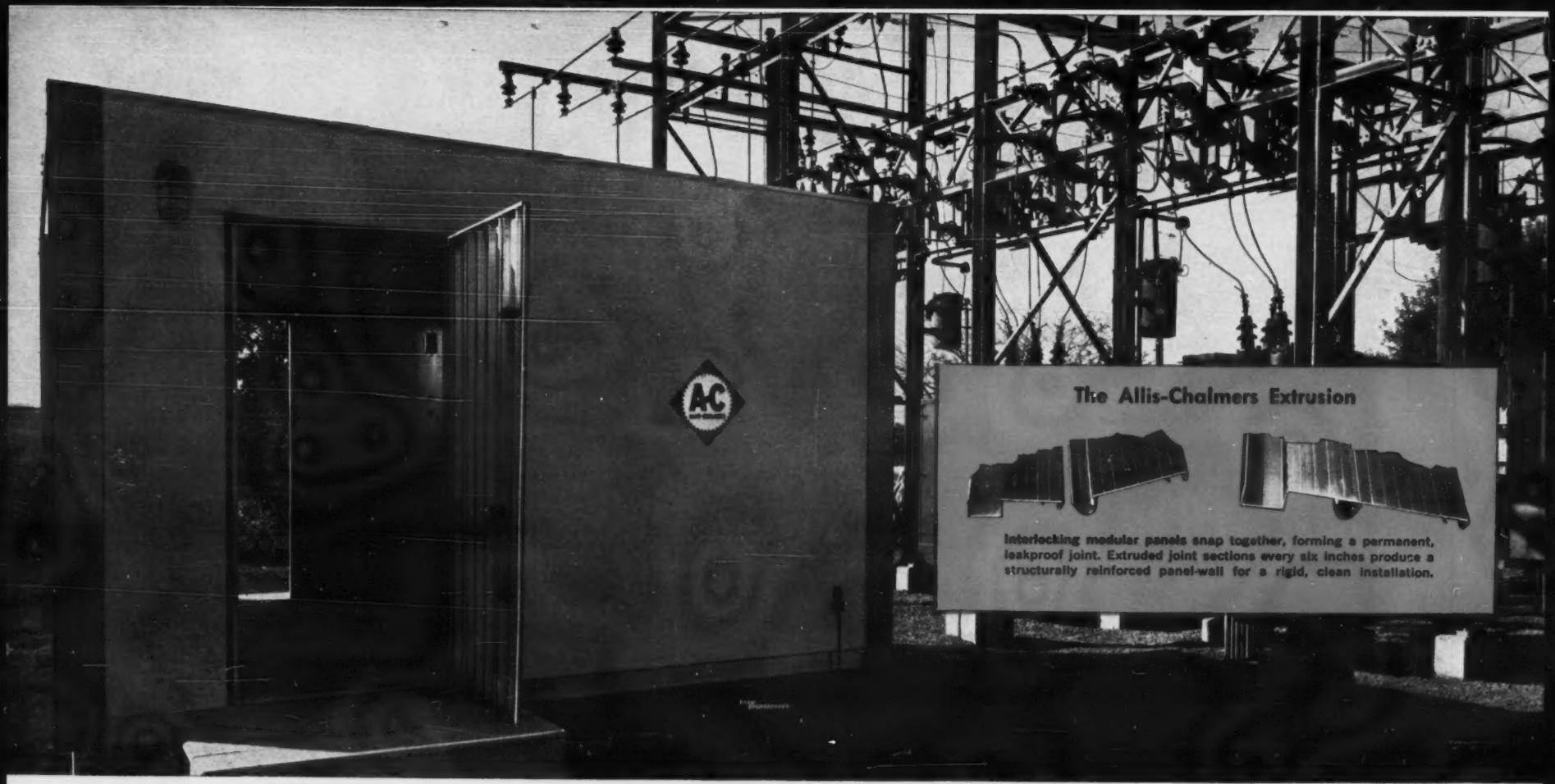
Harry T. Morgan (left in photo) described the improved and more economic protection afforded the Electric Power Board of Chattanooga's 12.5-kv distribution by oil circuit breakers in the substation and sectionalizers on the feeder. The modest price of sectionalizers gives system protection at a lower cost than would heavy-duty reclosers. Furthermore, the OCB relays, he said, do not require coordination with other interrupting devices and can be set for more sensitive relaying and faster interruption.

US Company Sets Nuclear Exchange With India AEC

A nuclear exchange agreement has been signed by Atomic Power Development Associates, the 43-member non-profit research arm of Power Reactor Development Co, and India.

Principals in the signing were Walker Cisler, board chairman of Detroit Edison Co, for APDA, and India's AEC head, Homi J. Bhahba, at a recent meeting in Washington. Under the exchange, to cover non-restricted information and teams of scientific personnel, India will receive information on breeder reactor technology and physics, as incorporated by the Fermi fast breeder design. APDA in return will share in nuclear fuel fabrication and uranium reprocessing methods possessed by India.

Since India has no formal bilateral agreement with the US, this latest exchange agreement augments the present informal cooperation in nuclear matters and development which, according to Bhahba, works out in a "satisfactory manner." APDA will be required to report details of all exchanges to the United States AEC.


The Allis-Chalmers Extrusion
Interlocking modular panels snap together, forming a permanent, leakproof joint. Extruded joint sections every six inches produce a structurally reinforced panel-wall for a rigid, clean installation.

A new metal for switchgear housings!

Allis-Chalmers *aluminum* switchgear housings offer:

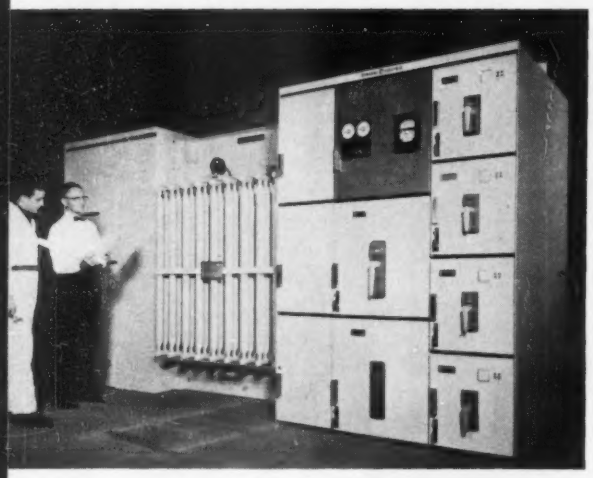
- easy installation
- attractive appearance
- corrosion resistance
- lower maintenance

For more details on aluminum housings . . . or steel, contact your nearby A-C office or write **Allis-Chalmers,** *Power Equipment Division, Milwaukee 1, Wisconsin.*

ALLIS-CHALMERS

A-1407

New Equipment



Load Center Unit Substation...

. . . features drawout switchgear that incorporates complete compartmentation of breakers, bus and cable termination. For use in utility generating stations the new type AKD-5 Powermaster Low Voltage Switchgear permits operating personnel to rack the breaker to 'connected,' 'test,' or 'disconnected' position with the door closed. Positive interlocks prevent inserting or withdrawing breakers when closed. Breakers are closed by stored-energy mechanisms to assure quick, positive closure and to provide momentary capability to carry through until back up fuses or breaker operates. The largest breaker of the unit is good for 85,000 symmetrical amp at 600 v, or 130,000 symmetrical amp at 240 v. Fuses are interlocked with breaker.
General Electric Co, Schenectady 5, N. Y.

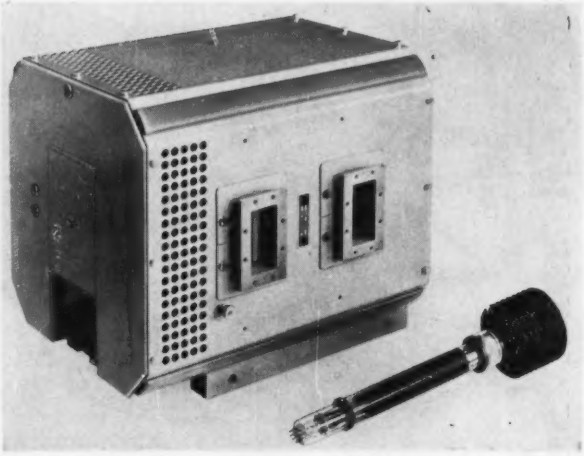
Travelling Wave Tube . . .

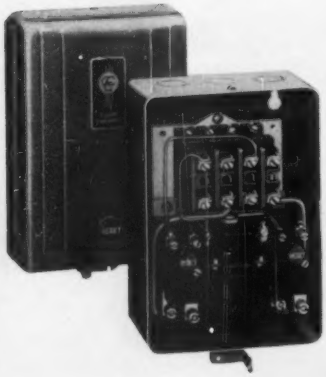
. . . operating as a broad band amplifier in the 4,400 to 5,000 Mc range is well suited for unattended microwave stations. The tube, designated type 7537, has a guaranteed minimum life of 6,000 hr. Mount and tube are designed so that input and output circuits remain matched when new tube is inserted.

The 7537 can deliver a saturated power output of 6 w. The low level gain at 5,000 Mc, with the output power of 100 Mw, is better than 34 db. With the output power at 2.5 w, the gain is better than 32 db.

The wave propagating structure is of the helical type. Electron beam focusing is by means of a permanent, uniform field magnet. The mount couples to standard rectangular waveguide WR 187.

The 7537 operates at the comparatively low figure of 1,150 v, which simplifies power supply problems.
Amperex Electronic Corp, Microwave Tube Department, 230 Duffy Ave, Hicksville, Long Island, N. Y.



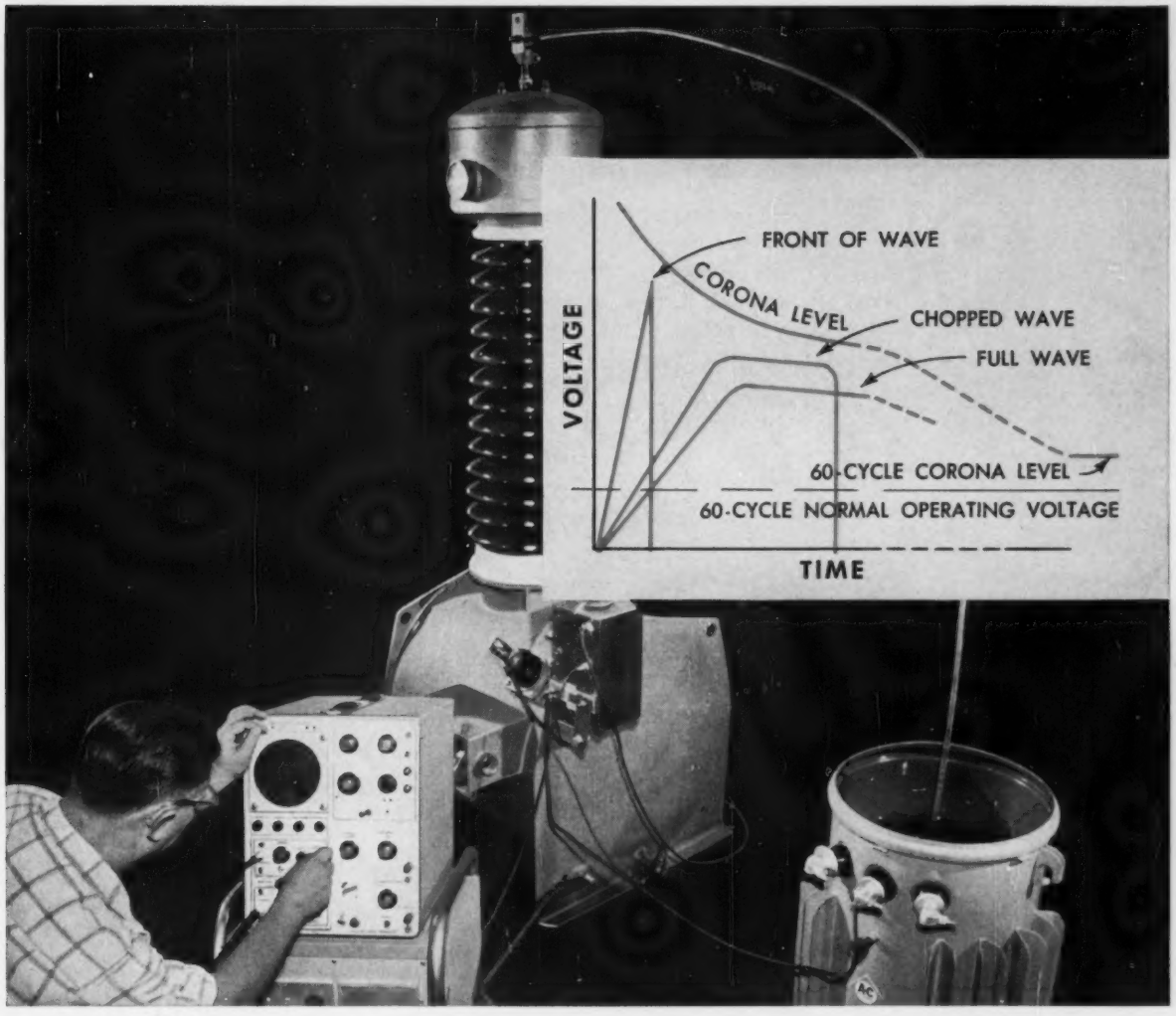


Starters . . .

. . . and contactors for nonreversing, full-voltage starting of 1/6 to 2-hp squirrel cage motors, single or 3-phase, 110 to 600 v, 25 and 60 cycle. Starters are equipped with melting-alloy, thermal-overload relays. They are available as open type or in NEMA Type 1, general purpose enclosures for separate push button operation (Form MA), or with 'Hand-Off-Automatic' (Form MB) or with 'Start-Stop' (Form MC) push button.
Clark Controller Co, 1146 E 152nd St, Cleveland 10, Ohio.

ALLIS-CHALMERS

A-1391



Proven corona-free design lengthens transformer life

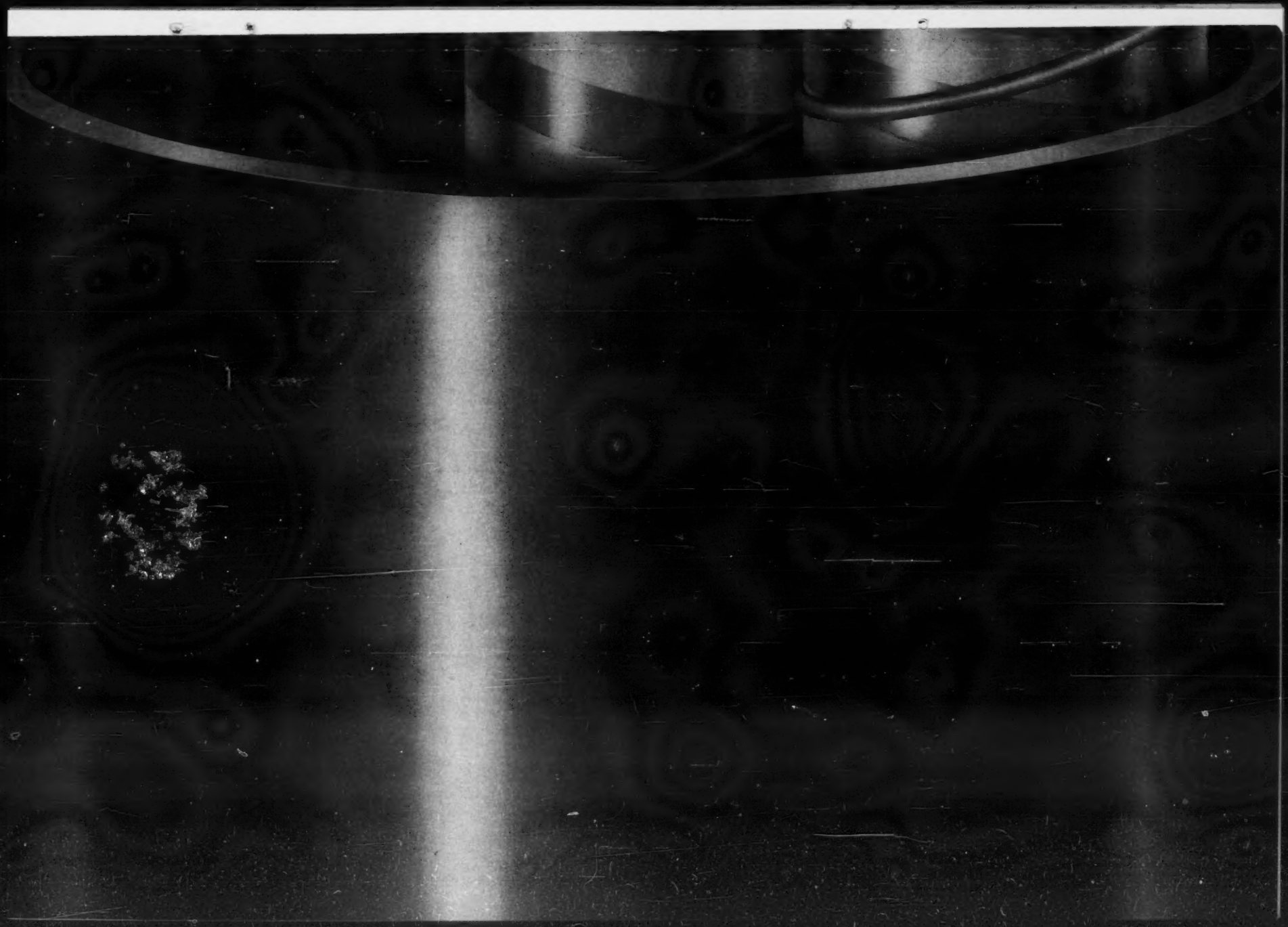
Allis-Chalmers transformer insulation (both winding and barrier) is designed (and proven by tests) to be *entirely free of corona*... not only at the operating voltage, but at *all test levels.* By use of superior measuring techniques and instrumentation, Allis-Chalmers engineers have established design criteria which bring this benefit to all A-C transformers from 5 kva through power transformers in the ASA standard range. Corona — the cancer of electrical equipment — is eliminated. The problems of carbonization of insulations and thermal breakdown of oil are substantially reduced.

Extensive studies on "compatibility" of insulations have also helped to increase transformer life. Through accelerated tests on many laboratory models and long-time tests on completed transformers Allis-Chalmers engineers have determined the ideal material combinations. Controlled processing to eliminate air and moisture lowers moisture content to as low as twenty parts per million.

Because of these three major factors . . . all A-C transformers in the above ratings built since January 1, 1960, are capable of delivering a twelve-percent increase in capacity at 65 C rise without loss of life.

• • •

For more information *about the additional built-in capacity of Allis-Chalmers transformers call your nearby A-C representative. Or write, Power Equipment Division,* **Allis-Chalmers,** *Milwaukee 1, Wisconsin.*



ANACONDA®
designs
and
makes both
ACCESSORIES
and EHV cable

The same engineering teams research, develop and use-test both EHV accessories and cable at Anaconda. The advantage is clear: no weak links in the system.

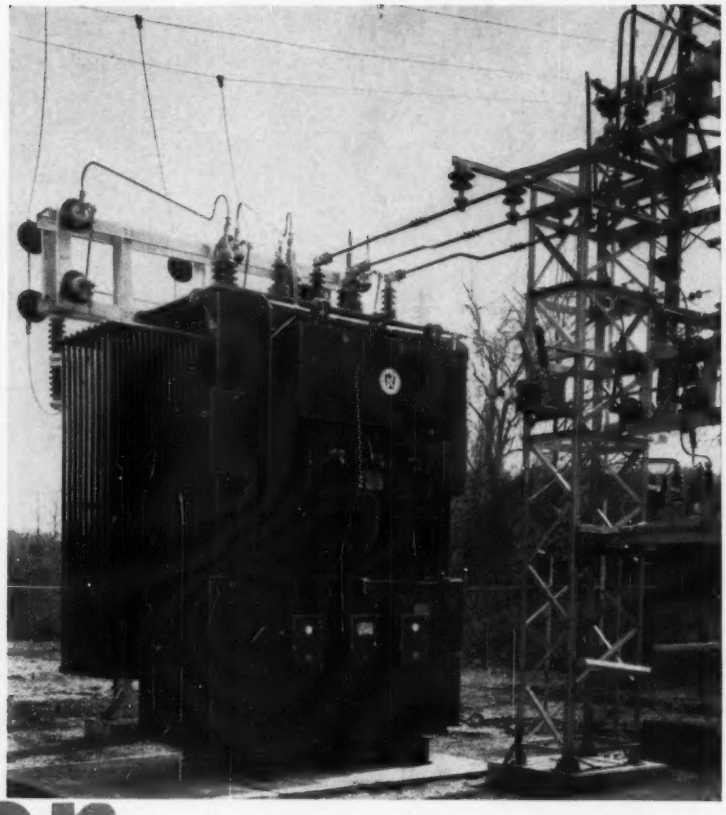
This coordinated effort has another customer benefit —special accessory problems can be considered when the system is designed. For example:

One customer needed a semi-stop joint that would not only locate faults and isolate any pressure loss in HPOF pipe-type cable, but would also let the cable move longitudinally without disrupting the seal or crushing the insulation. Anaconda met both requirements with a flexible barrier design that also matched cable characteristics perfectly.

In another typical case, a customer desired a preassembled termination unit that would provide controlled bending and fast sealing of pipe-type cable during the difficult pull to the first manhole. Furthermore, the customer's operating requirements would allow no welding either during or after the pull. Anaconda answered the problem with a "drop-casing" terminal assembly that proved to be a unique solution.

These examples won't necessarily parallel your own requirements, but they do demonstrate Anaconda's capacity to develop specialized accessories that meet the requirements of the customer and the cable equally well. To find out specifically how Anaconda's Integrated Approach can solve your EHV accessory problem, contact Anaconda Wire and Cable Co., 25 Broadway, New York 4, New York. 60227

See the man from
ANACONDA®
for accessories



do you have a question

about Pennsylvania's phase-isolated* LTC transformer?

Since the introduction of the Phase-Isolated LTC Transformer little more than a year ago, many questions about it have been asked by utility people throughout the country. They have wanted to determine just how this new LTC unit would benefit them. Answers to the following typical questions describe Pennsylvania's Phase-Isolated LTC Transformer and show how it will effect savings and improve distribution system operation.

Q What is unique and different about Phase-Isolated compared to conventional LTC?

A Phase-Isolated LTC provides *independent*, automatic phase regulation and includes *integral* by-passing, disconnecting, and grounding switches.

Q What is the advantage of single-phase regulation?

A Voltages over the three phases of a distribution system can be held to closer limits, and with higher average voltage. This means construction expenditures are delayed by heavier loading or longer feeders, and revenue is increased from voltage-sensitive loads.

Q Can the LTC switches be maintained without de-energizing the transformer?

A Yes, and the LTC switches can be maintained phase-by-phase, with the remaining phases continuing in automatic operation. Individual oil systems and cover plates are provided for the LTC phase compartments.

Q Can the LTC switches be maintained in complete safety?

A Each LTC switch is key interlocked with its by-pass assembly, permitting by-passing only when the LTC mechanism is on neutral. Proof that the LTC equipment is disconnected is provided by potential checks at test terminals before and after switching. In addition to automatic grounding by switch operation, pads are included for temporary external safety ground connections.

Q What is the cost for Phase-Isolated LTC facilities?

A Surprisingly little. For example, less than $1000 is added to the cost of a typical conventional 5000-kva LTC transformer. The added cost of installing the equivalent separate units would be many times this amount.

For answers to other questions about the features and application of Pennsylvania's Phase-Isolated LTC Transformer, write on your company letterhead. Ask for booklet No. 591. Address Power Sales Department, Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pennsylvania. *Patent Pending

McGRAW EDISON

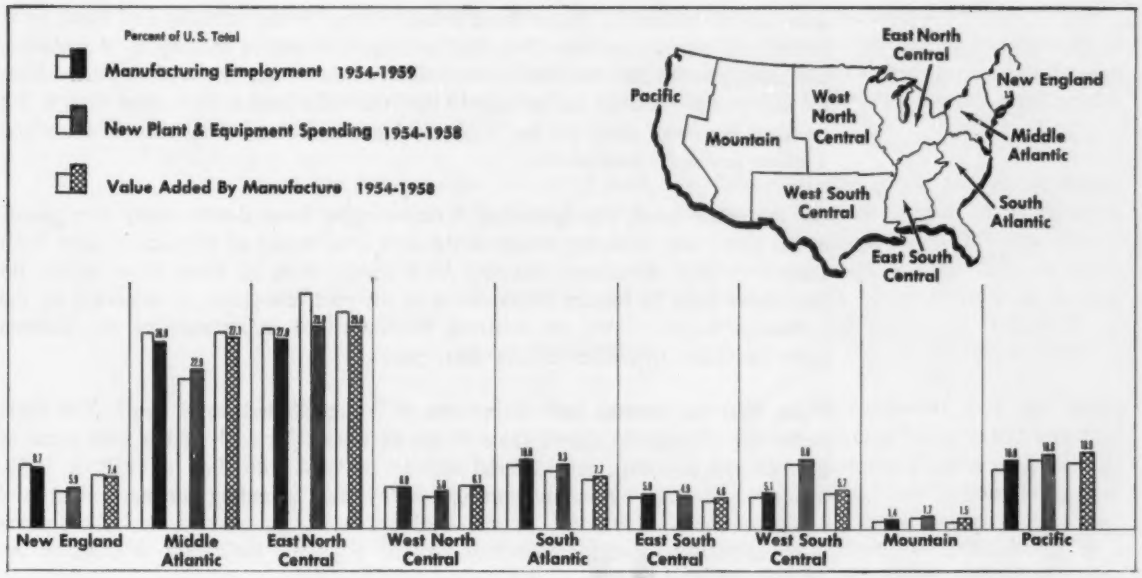
PENNSYLVANIA TRANSFORMER

PENNSYLVANIA POWER TRANSFORMERS

Electrical World

JANUARY 9, 1961

Management Newsletter



Industry on the Move—West Pushes Ahead

For the first time since World War II, there are signs that the huge industrial migration from the Northeast and Great Lakes to the West and South may be slackening in rate, if not in volume. And the rate of decline in at least two of the three older industrial areas appears to be letting up a bit. At the same time, the positions of the new industrial areas are shifting relative to each other. At least, these are the indications in comparing some of the major indices of industrial activity, for 1954 and 1958-'59.

Of course, comparison of rates alone can be deceptive. In fact, the total volume of new industry in the growing West and South actually has been increasing. But because the industrial base in these areas increased so rapidly in the early Fifties, even the larger increments in the later part of the decade add up to a smaller percentage increase. For the same reason, the *rate* of industrial growth, measured by growth in factory jobs, is highest in the Mountain states, the least important industrial area in the country.

In fact, few industries ever considered deserting the established industrial areas in the North and East. In most cases, the motivation for building new plants in the West and South was to supply the new consumer markets produced by population increase in these areas. But few contemplated supplying existing Eastern and Northern markets from the new plants. The logic behind both decisions is the same: to have production facilities near the markets.

Of course, there are exceptions here too. For example, an inventory of new chemical process plants and facilities prepared by *Chemical Engineering* for 1960 shows a great preponderance of new activity in the South and West. In the older industrial areas, only New Jersey makes a good showing. And the rate of growth of food processing industry—measured by number of factory employees and value added by manufacture—has been much higher in the South and West than in other areas. But in both cases, decisions are based on the necessity to be near raw materials: oil and gas deposits in one case; farms and ranches in the other.

One big difference in new construction between the old industrial areas and the new ones is in location of plants. In the East and North, the past few years have seen a great exodus of plants from urban centers to the suburbs and rural areas around the cities. For one thing, traffic congestion makes movement of materials and manpower to and from the plant difficult in the center of the older cities. Sites for new plants—shorter but broader in the base—are hard to find. And even if this problem is solved, space for the huge parking lots demanded by today's motorized workers is usually unavailable.

On the other hand, the sprawling Western cities have drawn many new plants in the past years. Coming of age in the auto area, many of these cities have been shaped by this ubiquitous vehicle. As a result, most of them have racked up impressive gains in factory employment in the past few years, as indicated by the tabulation below. And, by contrast, the industrial importance of the Eastern cities has been dwindling in the same period.

What then has actually been happening to America's industrial map? The chart at the top of page 55 shows some of the answers. For each of the nine areas of the country, it compares industrial activity in 1954 with that in 1958 or 1959, measuring growth by manufacturing employment, spending for new plant and equipment, and value added by manufacture. Although none of the indices alone is an unqualified test, together they provide a general indication of some of the changes. For example:

• **Biggest loser since 1954 has been the East North Central area** comprising Ohio, Indiana, Michigan, Illinois, and Wisconsin. Collectively, it is the only US region that has slipped in all three of the indices studied. But despite a downgrade since 1947—when the section had 30% of the nation's 15,239,000 factory workers, compared to only 27% of the 16,507,000 factory workers in 1959—this area is still the industrial core of the country. And the proportion of industrial building

Percent Change in Factory Employment, 1954-1959, For Selected Cities

Most losers are in East and . . .		most gainers in West and South	
Detroit	—14%	Paterson	+ 5%
Buffalo	—14%	Minneapolis-St. Paul	+ 6%
New Britain, Conn.	—12%	Boston	+ 7%
Pittsburgh	—12%	Milwaukee	+ 7%
Chicago	—12%	San Francisco	+ 7%
Bridgeport, Conn.	— 8%	Portland, Ore.	+ 8%
Newark-Jersey City	— 7%	Houston	+19%
Kansas City	— 7%	Los Angeles	+21%
Rochester	— 6%	Dallas	+26%
Toledo	— 5%	Seattle	+31%
Providence, R. I.	— 5%	San Diego	+54%

contracts awarded to this region has been growing slowly and steadily. Moreover, expanding foreign trade and the growing industrial development in the states immediately to the west of this region could help, too.

Among the individual states, the growth leaders in the region are Indiana and Wisconsin, but principally because they have not slipped as far behind as some of the other states. In Indiana, the modest employment gains made in the automotive and electrical industries were mainly responsible for the state's growth. In Wisconsin, a mixture of growth in the machinery and transportation equipment industries was the stimulus.

Factory employment in both Illinois and Ohio actually declined from 1954 to 1959, with Illinois slipping from fourth place to fifth in total employment and Ohio from third to fourth. And Michigan has the dubious distinction of having lost factory workers faster than any other state in the Union, with 1959 factory employment below the 1947 level.

• **The nation's other industrial giant, the Middle Atlantic area is also losing steam,** but not as fast as its neighbors just to the west. Thus the percent of the nation's workers in the region—comprising New York, Pennsylvania, New Jersey, Maryland, Delaware, and the District of Columbia—has slipped from 28% in 1954 to 26.8% in 1959, accompanied by a decline in the actual number of factory workers in the region. But spending on new plant and equipment is actually on the rise, climbing from 21.5% of the national total in 1954 to 22.9% in 1958.

Why is this heavy industrial area now on the skids, relatively? For one thing, much of its industry is concentrated in the primary metals, heavy manufacturing, and textile industries, none of which are expected to see much more than average growth in the years ahead. And of course, some statistics can be read two ways. Thus lower employment in the steel industry is gloomy news to manpower statisticians. But to production men, it represents an increase in productivity as a result of heavy spending to automate and modernize production lines. Similarly, while the number of employees decreased in 14 industries in New York State, the value added by manufacture decreased in only two.

Best performer in this region was the crossroads state of New Jersey. Thanks to continued expansion in the electrical machinery and chemical industries, the state's two largest employers, New Jersey has run against the regional trend and chalked up a 2% gain in employment in the past half decade. Similarly, Maryland has managed to boost factory jobs 10% between 1954 and 1959.

• **Continuing its post-war growth, the South Atlantic region is steadily increasing** its importance on the US industrial map. It now provides 10% of all factory jobs and has registered good gains in both new plant and equipment spending and value added by manufacture over the 1954-1959 period. Moreover, in 1959, it accounted for 17% of all industrial construction contract awards. Although its position as the nation's third industrial region is now being challenged by the three Pacific states, this challenge reflects principally the spectacular West Coast growth rather than laggardness in the South Atlantic area.

Moreover, the South Atlantic region is now making most of its gains in durable goods, in contrast to the rapid soft goods growth from 1947 to 1954. Thus employment in metal fabricating is up 35% over the last five years and electrical machinery employment ahead by some 40%. Among the individual states, factory employment jumped 50% in Florida, 8% in Georgia, over 8% in North Carolina and—despite a sharp fall in textile production—over 2% in South Carolina.

• **In New England, industry appears to be levelling out at last** after half a century of downgrade. Thus employment in the six states as a whole grew slightly from 1954 to 1959, reversing the area's employment slump in 1947-1954. Among the

individual states, Massachusetts, the largest employer of the six, grew somewhat faster than the national average. New Hampshire also edged up its total employment, with rises of about 30% in both the electrical and non-electrical machinery industries.

One reason factory jobs have held up well in New England recently is that the older industries, notably textiles, had already deserted it. And with the cold war pushing research and development programs, the area's excellent educational facilities have lured in a fat crop of electronics and related companies.

• **Typifying the rapid industrial build-up in the South and West** is the excellent record chalked up by Texas and its immediate neighbors—Louisiana, Oklahoma, Arkansas, and New Mexico—a region whose gain in factory jobs has outstripped that of the nation as a whole. Spurred by population increases, the region has been steadily broadening and deepening its industrial base and adding durable goods industries at the same time its soft goods industries have been growing. Thus manufacturing employment for the region as a whole rose some 10%. And jobs in food processing grew 12%, with substantial increases in primary metals, lumber, and the stone, clay and glass industries. Only in Louisiana was employment off—about 6% in the last five years.

Texas itself is probably the outstanding example. Of 18 major industries in the Lone Star state, only the lumber, leather, and miscellaneous group of industries showed decreases in employment. And job gains of 15, 20, and even 25% were scored by many of the other 15 industries. Thus, food processors reported payrolls 26% larger in 1959 than in 1954. Employment in the electrical machinery industry doubled in the last half decade, while fabricated metals and the stone, clay and glass industries showed gains of 50% in employment.

• **After a steady increase in its share of factory jobs from 1939 to 1954,** the West North Central area appears to have levelled out at about 6% of the national total. At the same time, this seven-state area, including Iowa, Missouri, Kansas, Minnesota, Nebraska, and the two Dakotas, has registered the nation's biggest increase in spending for new plant and equipment in the last half decade. While this area is dwarfed industrially by the Middle Atlantic and the East North Central areas, it is laying the groundwork for an industrial expansion which could push it ahead of New England in number of factory employees. And although this region trails New England in value added by manufacture, it has a healthy margin in industrial building contracts.

• **Fastest growing industrial area, the seven Mountain states is also the least** important industrially. Here again, the trend in manufacturing is from an even durable-soft goods split to one slightly favoring durable goods. And since none of the states—Colorado, Montana, Idaho, Wyoming, Utah, Nevada, or Arizona—employs over 0.5% of the nation's factory employees, small numerical gains here make impressive percentages. Thus jobs in Colorado climbed 21%, including gains in the auto, aircraft, non-electrical machinery, and printing and publishing industries. And Wyoming, with only 8,000 workers, posted an 18% gain in the past five years, while Arizona racked up a 70% increase.

• **The 1954-1959 period saw the Pacific region pulling up fast on the South Atlantic** for third place on the nation's industrial roster. Thus manufacturing employment in the three states—California, Washington, and Oregon—is up 21%, making the region's share of the national total 10%. And payrolls on the West Coast are growing at a faster clip than those in the South Atlantic area.

Some 70% of the regions factory jobs are in durable goods industries, now growing twice as fast as the soft goods industries. One notable change has been a growth of the electronics industry here, at the expense of the aircraft industry, as defense emphasis shifted from aircraft to missiles.

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Appalachian Sets Up Heating Dealer Plan

Utility's aim is to give homeowner place where he can get complete heating installation and full coverage

In a move designed to develop prestige electric heating dealers from whom existing homeowners can buy a complete heating installation with full coverage, Appalachian Power Co has launched its Reddy Kilowatt Recommended Electric Home Heating Contract Dealer Program.

This plan is the first of its kind in the country, according to Reddy Kilowatt Inc.

L. L. Koontz, Appalachian system residential and rural sales supervisor, said the plan was conceived because of the importance of developing the existing home market for electric heating. At present, about 30% of the installations being made in Appalachian's area are conversion installations. Also, there is a slackening in the number of new home starts, and it is important that more attention be given to the existing home market, according to Koontz.

To date, 95 home heating dealers have been signed up.

Appalachian now has a staff of 40 trained heating and building representatives devoting all their time to the development of electric home heating sales through these dealers.

Under the plan, Appalachian agrees to advertise extensively to promote electric home heating and the recommended dealers. However, the company's advertising will not favor any particular dealer or type of electric heating system, but will promote the advantages of dealing with an Appalachian Reddy Kilowatt Recommended Dealer.

Appalachian has established ten prerequisites which the dealers agree to in a written contract before they can participate in the program.

Each dealer agrees to:

1. Maintain an established place of business devoted to the sale of electric home heating equipment.

2. Provide satisfactory and reliable service on all electric heating equipment installed. (This service may be given by the dealer's organization or contracted for with another qualified service organization.)

3. Maintain adequate trained sales personnel and use sales programs and training material developed by Appalachian.

4. Vigorously and consistently promote electric home heating and use the Appalachian Reddy Kilowatt Recommended Dealer identification in his store and advertising.

5. Participate in co-ordinated electric heating advertising campaigns developed by the power company.

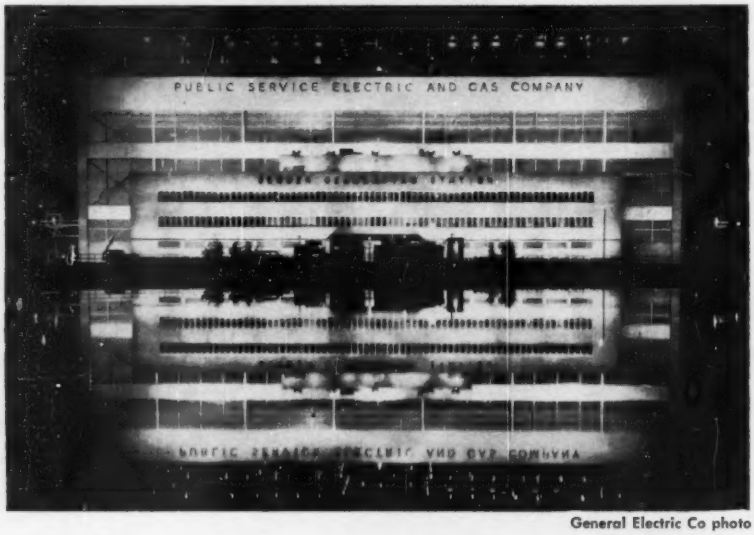
6. Contract for and accept responsibility for the complete heating installation, including insulation, and storm windows and doors.

7. Follow Appalachian's installation standards for electrically heated homes and provide prospects with a written proposal giving specifications, design conditions, and an estimated annual electric heating cost on residential installations.

8. Correct any installation which does not meet the conditions set forth in the written proposal when the annual electric heating cost exceeds the estimate by more than 10%.

9. Guarantee that the annual electric heating cost will not exceed the estimate by more than 10% for a period of two years.

10. Follow up leads developed



General Electric Co photo

Generating Station Lighted to 14 Ft-C

This is not trick photography. It's the view motorists on the New Jersey Turnpike actually have of the new $110-million Bergen Generating Station of Public Service Electric & Gas Co.

The effect is achieved because there is a creek between the plant and the turnpike. Mirrored in the creek, the administration building and turbine room are floodlighted by 136 units, including 96 400-w mercury luminaires.

The turbine room wall is lighted to 14 foot-candles; the administration building, 10.

Capacity of the new station is 580,000 kw, bringing Public Service's total generating capacity to 3,154,000 kw.

by Appalachian and report to the company all installations made on Appalachian lines.

The utility will furnish identification cards of recommended dealers for sales people, decals, a dealer certificate showing he is affiliated with the program, newspaper mats, annual electric heating cost guarantee certificates, proposal folders for making sales presentations to prospects, and special incentives for dealer salesmen.

M-H to Market Residential Air Cleaner

A residential electronic air cleaner which can be installed with any type of forced air central heating or cooling system in new or existing homes will be available this month from Minneapolis-Honeywell Regulator Co.

The product is a compact, highly flexible, two-stage unit with efficiencies ranging up to 90%, the company claims.

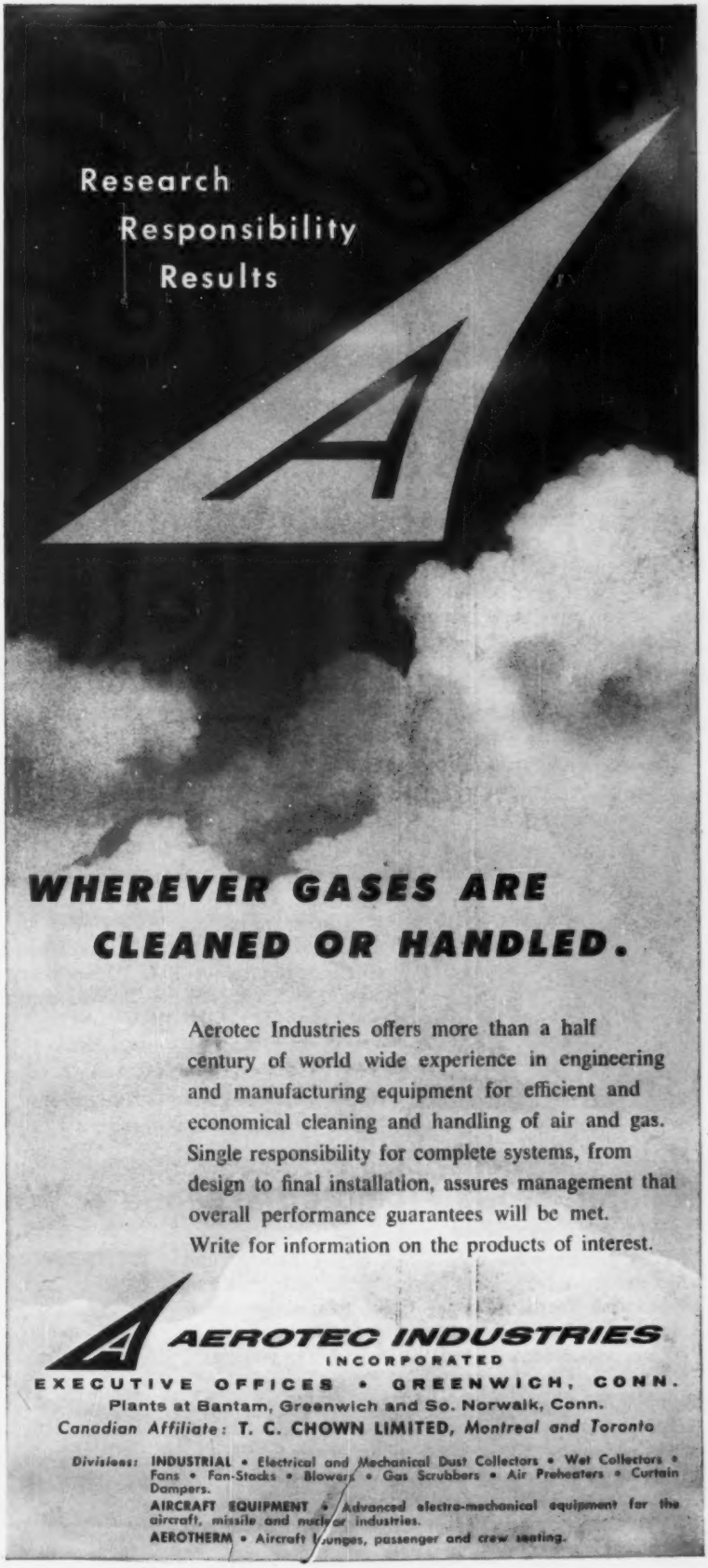
Prewired and assembled at the factory, the unit is 8 in. wide, 22 in. high and 31 in. long, or small enough to fit in the ductwork of the average home.

The unit is to be installed in the return-air plenum and operates on 120 v. No plumbing is necessary.

The Honeywell system is claimed to be the first on the market which uses a living area control center. This center is a 5x7-in. panel mounted in the living area which tells the homeowner when the air-cleaning cell in the system should be removed and washed. The panel also indicates if the unit is operating properly, shows if the protective screen is clogged, and makes it possible to turn the heating-cooling fan on remotely.

With this one system, heating and air conditioning contractors can handle any one installation job requiring a capacity up to 2,200 cfm.

Tests have been made on the cleaner by the National Bureau of Standards. These tests show that efficiency of the standard model ranges from 90% at 800 cfm to 70% at 1,400 cfm. Other models are available with efficiencies ranging from 90% at 1,200 cfm to 70% at 2,200 cfm.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Carolina P&L Elects Five Vice Presidents

Carolina Power & Light Co has elected five vice presidents: A. J. Skaale, operations and engineering department head; H. G. Isley, general sales manager; D. E. Stewart, area development manager; E. N. Pope, advertising and sales promotion director; and Shearon Harris, associate general counsel.

A University of California graduate, Skaale came to CP&L in 1930 after eight years with a West Coast utility. Isley, a Duke graduate, joined CP&L as a salesman in 1919 and held various sales posts, becoming general sales manager in 1940.

After two years with Westinghouse Electric Corp, Stewart, a graduate of N. C. State College, came to CP&L in 1925. He has served as an engineer, power salesman, and division superintendent. Pope, a graduate of Wake Forest College and Harvard, has served as salesman, residential sales manager, and advertising manager since joining CP&L in 1923.

FRANK FREER JR

Freer Is Named VP-Comptroller of PSE&G

Frank Freer Jr has become vice president and comptroller of Public Service Electric & Gas Co.

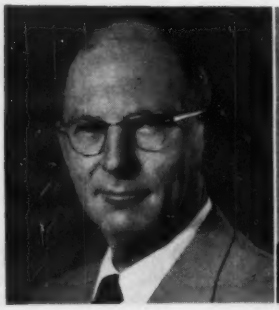
A graduate of New York University, Freer came to Public Service in 1920 as a bookkeeper. He was promoted to assistant chief accountant in 1935, and chief accountant in 1945. Five years later, Freer was boosted to assistant comptroller, and in 1957 he was named comptroller.

Rempe, Storrs Promoted at Stone & Webster Service Corp

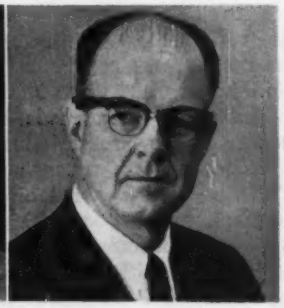
Peter J. Rempe has been named board chairman and chief executive officer and Lucius S. Storrs Jr president of Stone & Webster Service Corp, management consultant subsidiary of Stone & Webster, Inc.

Rempe succeeded Richard N. Benjamin as chairman; Benjamin continues as Stone & Webster, Inc, president. Rempe joined Stone & Webster in 1928 and was made a Service Corp vice president in 1939. He became senior vice president in 1954, a director in 1957, and president in 1959.

Storrs came to Stone & Webster in 1933, became a Service Corp vice president in 1954, and a director and executive vice president in 1959.



REMPE



STORRS

LANPHIER

Lanphier President of Fairbanks, Morse & Co

Thomas G. Lanphier Jr is the new president of Fairbanks, Morse & Co, subsidiary of Fairbanks Whitney Corp.

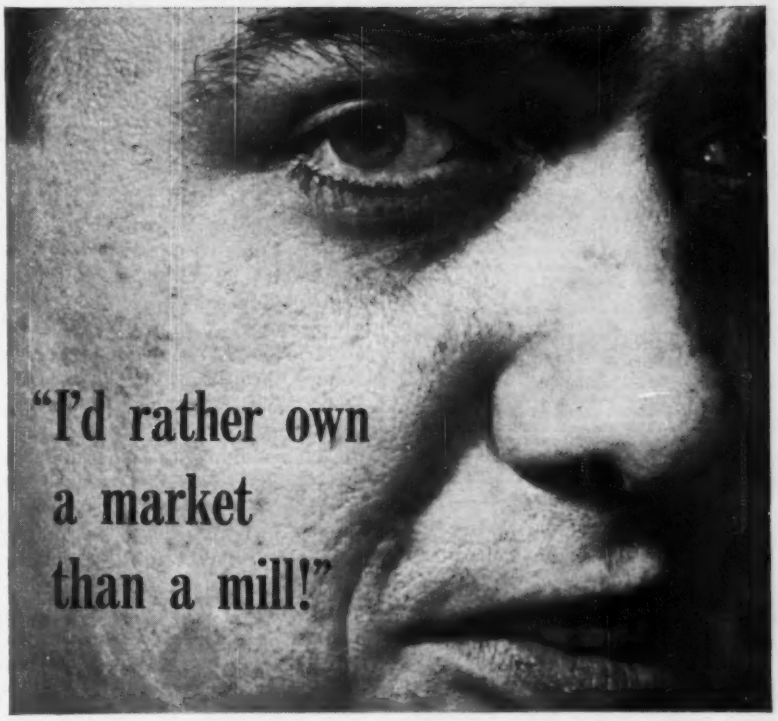
Lanphier came to Fairbanks Whitney in September of last year as vice president-planning, a position he will retain. Previously, he had served almost ten years as vice president and assistant to the president of Convair Division of General Dynamics Corp.

PERSONAL BRIEFS

The following have been appointed Fellows of the American Institute of Electrical Engineers: **Clifford C. Diemond,** substation maintenance supervisor, Bonneville Power Administration, for contributions to power system protection; **Edward A. Erdelyi,** electrical engineering professor, University of Delaware, for contributions to theory of noise in electric machinery; **G. Everett Farmer,** chief of the communication and design branch of the Tennessee Valley Authority, for contributions to development of a comprehensive communication system for a large power system.

Also: **Samuel F. Henderson,** manager, ac motor development engineering, motor engineering department, Westinghouse Electric Corp, for contributions to improvement of induction motors; **Marcus H. Lovelady,** vice president and chief engineer, Central Power & Light Co, for contributions to Southwest Power Pool Interconnected System and to engineering and management of an expanding power system; **Frank J. Maginnis,** manager of special studies and digital analysis engineering in the electric utility analytical engineering operation, General Electric

(*Continued on page* 64)



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And: **Thomas E. Marburger,** vice president-engineering and construction, Baltimore Gas & Electric Co, for contributions to management of construction, operation, and engineering of a major electric utility system; **Frederick M. Porter,** consulting electrical engineer, American Electric Power Service Corp, for contributions to hydrogen cooling of synchronous condensers and generators, excitation systems, and high voltage transmission; **Louis N. Stone,** electrical engineering department head, Oregon State College, for contributions to undergraduate and graduate electrical engineering education and to research in high-voltage phenomena.

Also: **Henry W. Smith,** executive vice president and director, International Power & Engineering Consultants, Ltd, for contributions to development of a large electric power system; **Francis O. Wollaston,** consultant to International Power & Engineering Consultants, for contributions to design of transmission at extra high voltages, overhead, underground, and underwater; **S. W. Herwald,** vice president-research, Westinghouse, for contributions to the theory and development of servomechanisms; **John B. McClure,** manager, power generation engineering, electric utility systems engineering, GE, for contributions in field of electric utility generating stations and electric power transmission systems.

Leslie J. Woods, vice president for research and engineering and a director of Philco Co, has retired.

Lacy Blake has become southwestern regional manager for the Albion Division of McGraw-Edison Co.

Frank G. Willey has become manager of infrared systems in the missile electronics and controls division of Radio Corp of America, and **F. L. Ankenbrandt** was named manager, defense product assurance.

Joseph Erickson, newly-elected president of the New England Council and president of the Federal Reserve Bank of Boston, has been made a director of Sprague Electric Co, as has **Dr Jerome B. Wiesner,** director of research laboratory at Massachusetts Institute of Technology, while **Dr Jeffold Zacharias,** MIT physics professor, has been retained as a consultant.

Minneapolis-Honeywell Regulator Co has made the following appointments: **Nilsson S. Barrett** to the federal services group in Washington as group marketing liaison with government agencies; **John O. Paull** as sales manager of the industrial systems division in Beltsville, Md.; **J. F. Smith** as industrial sales manager of the Pacific region in Los Angeles; and **R. E. Harris** as Southwest regional industrial sales manager at Dallas.

OBITUARIES

J. M. Costello, executive vice president, South Carolina Electric & Gas Co . . . **William L. Yoder,** 66, secretary and a director, Carolina Power & Light Co . . . **A. H. Schaars,** 54, personnel administrator, Wisconsin Public Service Corp . . . **John B. O'Donnell,** 49, distributor sales manager, Sola Electric Co . . . **Joseph Stallings,** 64, north Pacific district credit manager for Westinghouse Electrical Supply Co.

Russell McLean Shearer, 66, retired Mississippi Power Co vice president . . . **A. J. Borchers,** 65, retired Central Illinois Public Service Co vice president . . . **Fred S. Eichhorn,** 59, former chairman, Indiana Public Service Commission . . . **W. Wesley Hicks,** 76, founder-president, Wesix Electric Heater Co . . . **Walter G. Knickerbocker,** former general superintendent of meters, Detroit Edison Co . . . **Stanley M. Cameron,** 63, executive vice president, Howard P. Foley Co . . . **Stuart R. Ferry,** 61, supervisor; **Harold F. McCue,** 55, customer accounts supervisor in the south Philadelphia office; **William L. Brown,** 65, retired supervisor; **William F. Hamill Sr,** 86, retired electrical engineer, Philadelphia Electric Co . . . **Chester Ray Hazard,** 60, Portland district manager, Line Material Industries.

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Atom Group Meets

(*Continued from page* 31)

on low enriched fuels or corresponding lower capacities for highly enriched, alloyed or thorium-containing fuels at a daily operating cost of $21,000 when operating 200 days per year or $18,000 at 300 days per year. Capital costs for the plant would be $21,850,000 including provision for land, startup, licensing and capital costs. No AEC subsidies were included. Startup could be accomplished on a realistic schedule in early 1964. AEC processing charges on a similar basis for such a hypothetical plant after 1964 would be in excess of $18,000 per day because of built-in escalation of AEC charges. These figures were developed by the Bechtel Corp, with the help of AEC and several firms, in a study for the Davison Chemical Div of W. R. Grace & Co and five utilities known subsequently as the Industrial Reprocessing Group.

The aqueous Purex process was selected as the only practical multipurpose process available for this plant. The great versatility of the process lies in the fact that almost any fuel in existence could be reprocessed after it has been made amenable to dissolution in nitric acid. Consequently, head-end facilities were provided in the proposed plant design for mechanical sawing and chopping; chemical decladding of aluminum, zirconium and stainless steel; and total dissolution. Head-end facilities were not provided for treating graphite matrix elements of the Peach Bottom type or for uranium carbide, although space was provided for their later addition.

Tower Foundations

(*Continued from page* 38)

mately 1½ ft in the center. In addition to the surface subsidence, large cracks appeared in the banks around the site.

The work at the other tower legs was similar to that in the area test. During the compaction operations at Towers 2 and 3, it was necessary to vary the size and location of charges to compensate for variations in the soil and sizes of areas to be compacted. Pockets of silty materials do not readily shatter or change structure as a result of blasting.

Where pockets occurred, all of the compaction had to be obtained in the sandy materials surrounding them. Following evaluation of the first blast at each site, extra shots were added to compact the soil further where such conditions existed. Continuous close control of the operation is necessary so that charge spacings and numbers may be varied to take account of changes in soil conditions.

Explosive compaction is an effective method of in-place granular soil compaction under the right conditions. Full saturation is necessary and a relatively uniform material is desirable. The best weight of charge and depth of placing should be determined experimentally and should be such that complete shattering of the soil structure and liquefaction of the soil occurs without accompanying surface cratering. Measuring surface subsidence provides acceptable control and, together with well placed test pits, will provide the necessary information for evaluation of the results.

First Electric Furnace for US Glass Industry Planned

The first all-electric, glass bottle furnace in the US is now under construction at the Chattanooga Glass Co's Alton Park plant. The company's president, J. Frank Harrison, anticipates that the electric furnace will have longer life, shorter repair time, and greater economy of fuel cost than present furnaces which use other fuels. In addition, the electric unit takes up less space, and promises a better quality of glass.

Although many electric furnaces are used in the European glass industry, gas, with some electric boosters, has been the major fuel in the US. But preliminary studies indicate that the heat transfer efficiency of gas firing is only about 25% while an all-electric installation may reach 80%.

Larry Penberthy, designer of the furnace, had one small furnace operating experimentally for several months last year attempting to draw sheet glass in small units (10 to 40 tons per day), and is continuing research with his Penberthy Instrument Co of Seattle. Glass manufacturers are watching his progress. The Washington State Department of Commerce and Economic Development has also been studying this unit.

In an electric furnace, electrodes extend into the raw material from the sides of the furnace. The material is melted from below the surface of the glass ingredients. Raw material is fed in from the top as the glass pours out of the bottom of the unit into the feeder lines at about 2,180F.

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NO-ABRASION *ability*

The stainless steel bail has no peers. There is no coating to abrade away. 18-8 stainless steel will never rust or deteriorate in any known corrosive atmosphere.

REACH *ability*

The overall length of Strandvise averages less than 12 inches for most sizes.

SAFE *ability*

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NATURAL *ability*

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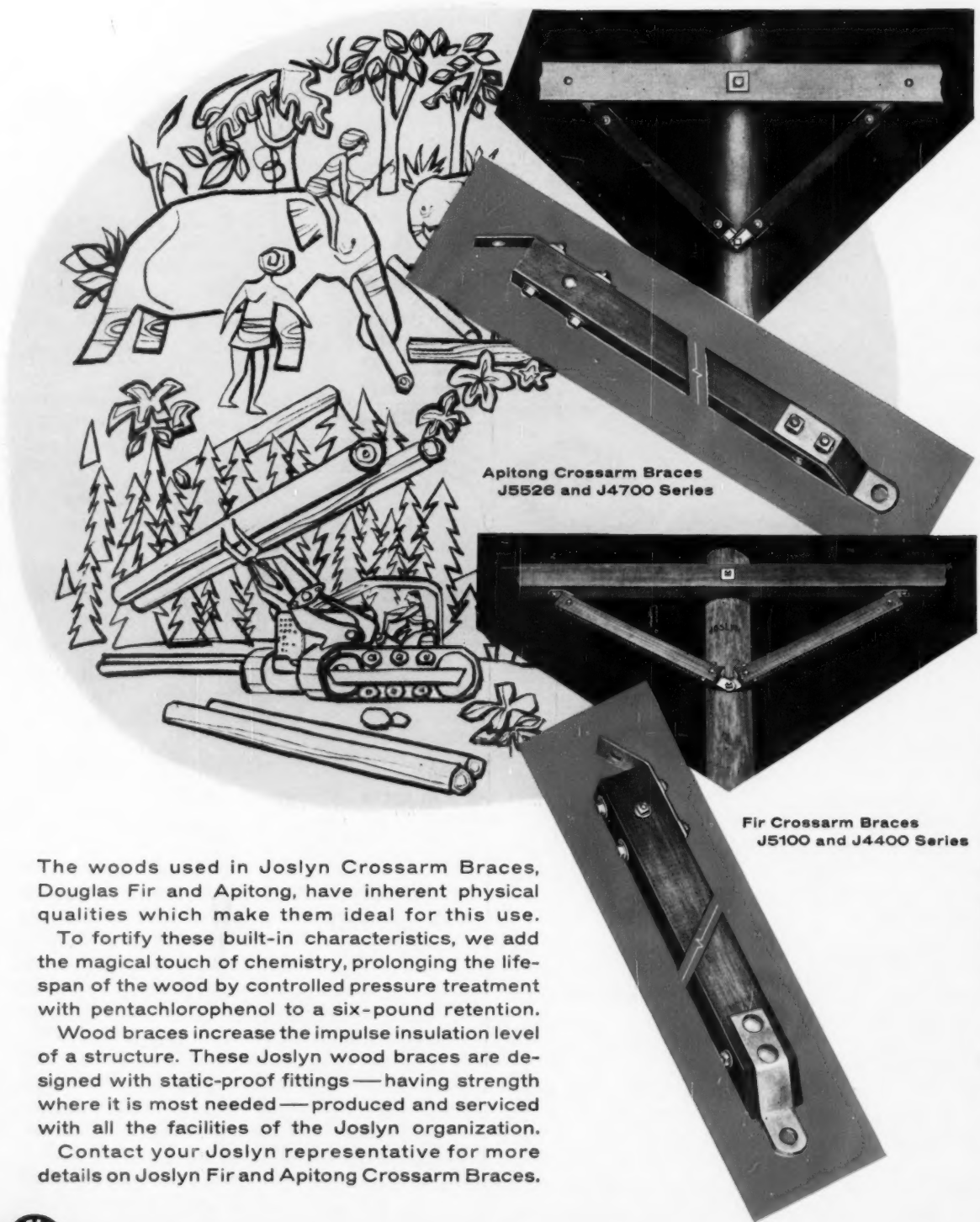

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